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Ognjan Petrović  
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# YUGOSLAV FIGHTER COLOURS 1918–1941



Vol. 1

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Ognjan Petrović  
Djordje Nikolić

Yugoslav  
Fighter Colours  
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Kruševac – Seattle, summer 2019

# Introduction

## Military aircraft 1918–1936

Immediately following the end of World War I, the Air Force of the newly formed Southern Slav State, the Kingdom of Serbs, Croats and Slovenes (*Краљевина Срба, Хрвата и Словенаца* – KSHS), was forced to rely mainly on inherited war-time Serbian Air Service (*Српска авијатика* – Serbian Aeronautics) aircraft and material left by France following the withdrawal of the French Air Force from the Balkans in 1919, and that from the French war surplus stocks starting in 1921. On 26 June 1919 the old Serbian Aeroplane *Escadre* (*Аеропланска ескадра*) was reformed into the Air Force Command, and at the beginning of October 1920 the Air Force Department was established within the Ministry of War and Marine. It was known as *Ваздухопловство Краљевине СХС* (V KSHS – Aeronautics of the Kingdom of SHS).

The available material in the immediate post war era was modern and technically good, especially the Breguet 14 bombers and Spad fighters, as well as the newer Nieuport fighter versions. Some of these aircraft were brand new and remained in use until the early thirties. Another source of supplies were the war trophy aircraft, mainly those from the Austro-Hungarian Air Service (*Kaiserliche und Königliche Luftfahrtruppen*, k.u.k LFT – Imperial and Royal Aviation Troops) and a small number from the German Air Service (*Die Deutsche Luftstreitkräfte*). Among the captured aircraft were modern and well-preserved warplanes such as Albatros D.III Oef, Aviatik D.I Berg, Ufag C.I, Phönix C.I and D.I and Rumpler C.IV and C.VII, as well as numerous trainers such as the Brandenburg B.I and C.I. Fighters served for several years in combat units, while all others served as trainers within the first observer and pilot schools.

Eventually, due to the decline in quality and obsolescence, the number of the wartime aircraft decreased rapidly and their replacement was urgently needed. The first new aircraft, Potez 15A2, arrived from France in the form of military aid and in 1925 French deliveries started according to the 1923 300 million francs loan for weapons purchases. KSHS received 150 modern Breguet 19 biplanes, 50 De-woitine fighters, 6 CAMS 30E flying boats and 320 aero-engines. These aircraft enabled the first major modernization of the V KSHS and the establishment of new regiments and *escadrilles*.

In the second half of the twenties, France was still the largest supplier of aircraft engines and equipment for V KSHS while working in cooperation with the growing local industry. The Government purchased license rights which preceded the delivery of a number of aircraft and engine types produced by the French parent companies. As a result, Hanriot H.320 trainers and Gourdou-Lesseurre LGLB fighter-trainers were imported in 1927 and 1928 respectively, Hispano-Suiza and Lorraine-Dietrich-powered Potez 25A2/B2 combat two-seaters in 1927, as well as a number of 420 mhp Gnôme-Rhône 9A Jupiter radials. However, during that period, V KSHS began gradually sourcing supplies from other countries. It started with the deliveries of combat seaplanes, Dornier Do-D floatplanes and Do-Wal flying boats,

*Captured ex-LFT aircraft with the Ljubljanska stotnija (Ljubljana Sqn), Šiška airfield near Ljubljana, September 1919. From right to left, with different interim national insignia of the new South Slav Kingdom: Brandenburg C.I (Ufag) 64.16 "Sinko", two Brandenburg C.IIs (Ufag) Ba.169 (the first is 169.177), UFAG C.I 161.143, Phönix C.I 121.68, Albatros D.III (Oef) 53.57 (partially mod Ba.253 standard), and two Aviatik D.I fighters (the first is 92.53). (Gulič family via Tomaž Perme and Marko Ličina)*





Very interesting scene as seen from the roof of a hangar at Novi Sad airfield, 1923. No fewer than 29 aircraft are parked in two rows. Four Phönix fighters (the first D.IIa and three D.Is) and seven Spad S.7s are visible in the first row. In the background (from right to left) are a Potez 15A2, a Bristol-Fighter F.2b, 11 Brandenburg B.I trainers and five biplanes. (Kees Kort collection)

and heavy multi-engined aircraft, Dornier Do-Y and Junkers G.24. These aircraft were mostly obtained through the German war reparation program and partially within commercial terms.

The Air Force Department was reformed on 24 February 1927 into the new Command at Army level. Two air regiments were formed in February 1925, one in March 1927, three between March and April 1928 and two in April 1939. The Air Arsenal was established on 21 April 1921 at Petrovaradin (today part of Novi Sad city).

From 1929 the monarchy changed its name to the Kingdom of Yugoslavia (KJ – *Краљевина Југославија*) and from 1930 the official name of the service branch was changed to *Ваздухопловство војске* (VV – literally Aeronautics of the Army, or more the appropriate English term Army Air Force, which is commonly known in the West as the Royal Yugoslav Air Force – RYAF). With this came cooperation with another friendly country, the Republic of Czechoslovakia, a member of the *Petite Entente* (Little Entente – political and military Agreement of three states: KJ, Czechoslovakia and Romania). As a result, KJ purchased license rights for 120 mhp Walter radials, Avia BH-33E fighters and Avia Fokker F.39 bomber/transport aircraft. In addition, 24 Avia BH-33E biplanes were purchased, four in 1929 and the rest in 1931.

France still held a privileged position in supplying the Royal Yugoslav Army during the early thirties. But because of French relative stagnation in the field of aviation technology and production, VV gradually turned towards England. British-built aircraft and engines equipped with high-quality superchargers, were considered better than the French. This was the reason why VV purchased only a license to produce three versions of the Gnôme-Rhône K-family radials, K-7 (7K Titan Major), K-9 (9K Mistral) and K-14 (14N Mistral Major) and imported a number of engines as well. In the first procurement from the UK (United Kingdom), three Hawker Fury Mk.IA fighters were imported in 1931 and, after long delays, 10 more Yugoslav Fury late models. License rights were purchased in 1935. This move came too late, as the era of biplanes was coming to an end and modern monoplanes were already under development, soon to be introduced in France, UK and Germany.

## 1937–1941 modernization

From 1936 VV was undergoing a process of reorganization and modernization, which reached its peak during the last three years of the peacetime period. Large changes took place related to the formation, new designation of units, selection and arrangement of war airfields, adoption of new doctrine, education and training of pilots and other specialists, selection and acceptance of the new imported and domestic-built equipment, organization of production of indigenous-design and license-built aircraft, writing of manuals, directions and regulations for aircraft and equipment, selection and application of the new aircraft camouflage painting and serial numbers. On 16 December 1938 a new war formation was accepted – with air regiments consisting of two air groups with two (rarely three) *escadrilles*. VV was officially divided into three segments, known as *Оперативно ваздухопловство* (Combat Aviation lit. Operational Air Force equipped with warplanes and auxiliary aircraft), *Армијско ваздухопловство* (Army Co-operation Aviation with reconnaissance/observation aircraft for cooperation with Royal Yugoslav Army) and *Позадинско ваздухопловство* (Auxiliary Aviation with trainers and support aircraft).

The modernization of VV began in 1937 by purchasing the most modern aircraft of that time. These aircraft were imported from UK, Germany and Italy, or simultaneously built under British and

German licenses by local factories. Indigenously designed aircraft types were also built. Modernization was carried out despite economic and international conditions when most European countries were preparing for the upcoming military conflict. One of the most difficult problems for VV was the lack of aero engines. As the situation was getting worse, the domestic industry could not fulfil the deliveries of the ordered warplanes. But the Royal Yugoslav Government and military authorities, as well as local aviation experts, deserved praise for their efforts. They managed to very successfully implement the modernization which, unfortunately, was not completely finished because of insufficient resources and limited time.

Until the 1941 April War, VV imported a small number of two types of French in-line engines, for the Ikarus IK-2 (Czechoslovak Avia-built 12Ycrs licensed derivative) and for the Rogožarski IK-3 (original French 12Y-29). VV also purchased French radials, two Hispano-Suiza 14Ab 02/03 for the Zmaj R-1 and two (of 30 ordered) Gnome-Rhône 14N 38/39 radials for Rogožarski IK-5 twin-engine heavy fighters. In addition France delivered two Potez 63 C3 heavy fighters, while the intended and planned deliveries of Morane-Saulnier MS.406 C1 and Koolhoven FK.58 fighters never materialized.

Between December 1938 and March 1940, 24 Hawker Hurricane Mk.I fighters were imported from the UK, while Zmaj factory delivered the next 24 license-built Hurricanes, of which the last nine were completed during the first days of war. From August 1939 until May 1940 Germany delivered 73 most modern German fighters, the Bf 109 (Messerschmitt Bf 109E-3a), to VV.

In the period from 1937 to 1941 KJ succeeded, as much as possible, in equipping VV with a number of the most advanced fighter types, which were used at the same time by two of the largest air powers, the German *Luftwaffe* and British Royal Air Force (RAF). Unfortunately, VV failed to obtain any heavy fighters. Also, VV failed to complete the process of re-equipment with planned and needed quantity of aircraft before the war.

## International participation

Besides manoeuvres, VV aviators proved their professional flying ability in domestic and international competitions and meetings. The most important domestic competition was the King's Trophy air race, which was held each 6 September from 1926 to 1936 (except in 1930) in three categories: battle two-seaters, fighters and trainers. An important foreign demonstration was the Circuit of *Petite Entente*, which was carried out four times between 1927 and 1930. The winner of the first competition was a VV crew flying an indigenously-designed Fizir-Maybach prototype built by AR 1.VP (Аеропланска радионица 1.ВП – 1<sup>st</sup> Air Regiment's Aircraft Workshop). A Yugoslav crew also won in the fourth competition (1<sup>st</sup> and 3<sup>rd</sup> to 6<sup>th</sup> places) using the new “second generation” Breguet 197 bomber biplanes. VV also participated at the Zürich International Meetings in 1927 and 1932 in two-seater and fighter categories. In August 1927 a Yugoslav Dewoitine D.9 C1 was the only aircraft which flew over the Alps in poor weather and the crew of Potez 25 Lorraine won 8<sup>th</sup> place at The Alps Circuit for military aircraft. In July 1932 a VV pilot won with a Hawker Fury Mk.IA fighter.

*Spad S.7 and S.13 fighters from 1.E at Pančeva airfield, April 1921. Note that French markings are still carried on these fighters, which had just entered the V KSHS inventory. (Tomaž Perme and Marko Ličina)*



## Infrastructure

At the beginning of the twenties, the undeveloped VV infrastructure consisted of several airfields left by the enemy, of which the most important ones were at Novi Sad and at Mostar. As a result, construction of eight new airfields started in different regions of the country (Belgrade, Skoplje, Niš, Kraljevo, Zagreb, Sarajevo, Pančevo and Bela Crkva) and was completed at the beginning of the thirties. These airfields had wide and long grass runways, large hangars of concrete or metal construction, storage areas, workshops and other related facilities. Five airfields were divided between military and civil users. Immediately prior to the the 1941 April War, 100 auxiliary war airfields were prepared. In 1936 VV Headquarters (HQ) was relocated from Petrovaradin to Zemun (from 1919 part of Belgrade Municipality), to a new building constructed in 1935 which was designed by famous Serbian architects Brašovan and Jovanović.

## Training

During the development and constant improvement of the organization's peacetime and wartime formation, VV built and constantly updated its own complex system of continuous personnel training. The pilot officer training was organized in 1919 at Novi Sad and for non-commissioned officers in 1921 at Mostar. Reserve pilots began training in 1922. Two schools were formed, *Ловачка пилотска школа* (LPŠ – Fighter Pilot School) at Zemun (1928), and *Ваздухопловна школа гађања* (VŠG – Air Gunnery School) at Bela Crkva, near Vršac (1931). These special schools provided the training of reconnaissance and technical personnel, meteorologists, paratroopers and other specialists. From June 1940 the Air Force Academy opened at Pančevo. Air officers foreseen for high rank duties were trained at the General Staff School, while a significant number of aviators were sent to foreign air forces. From 1919 to 1941 flying schools trained 2,677 pilots for VV and Naval Air Service.

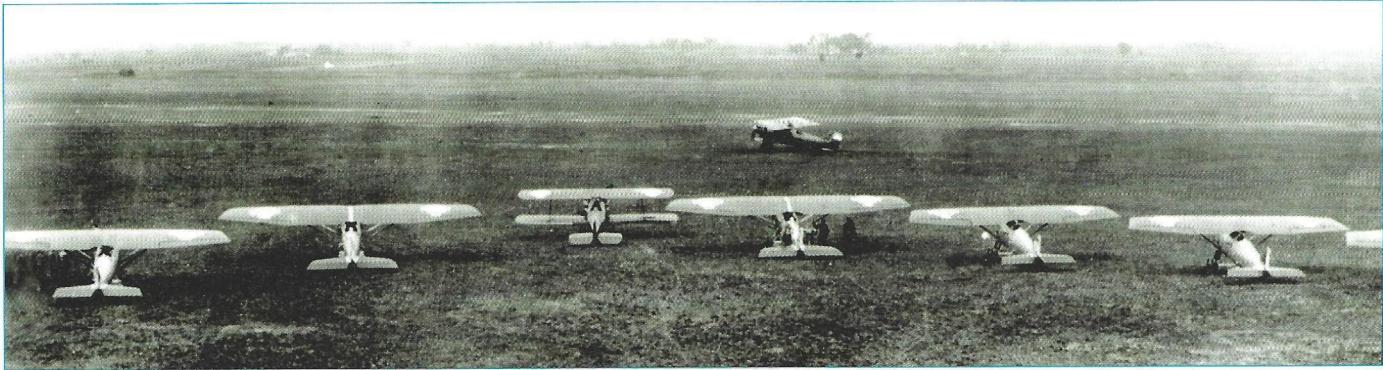
## Aviation industry in Serbia and Yugoslavia 1923–1941

The first ideas that it was necessary to create own aviation industry were born during World War I by Serbian aviation officials. The realization of those ideas was achieved in 1923 due to the urgent need of the Air Force for trainers. Since trainers could not be purchased abroad due to many difficulties and lack of credits, the Department of Aviation had to organize production of these trainers in the country, relying on private funds, local experts and workers. Such direction was the confirmation that those responsible in the state and the Army were of the conviction that successful and independent development of domestic aviation could not be achieved without own aviation industry, and indigenous designer personnel. It was easier to make such a decision because of the fact that the production of aircraft at that time, mostly of wooden structure, could successfully be organized in a craft and semi-industrial manner. A group of experienced engineers and professionals, mostly of South Slavic origin, who gained rich experience in designing and manufacturing aircraft during World War I in Austro-Hungarian, German and Russian aircraft factories, also contributed to an early appearance of the domestic aviation industry.

*Fighters from 125.VG, which were relocated from Novi Sad, lined up at the newly opened Belgrade-Zemun airfield, 1927. Note D.9 C1 №2 and №5, seven D.1 C1 fighters and two trainers in this shot. (Janko Dobnikar family via Predrag Miladinović)*

Without a doubt AR at Novi Sad, originating from the Serbian Air Park at Salonika front, was regarded as the forerunner of Serbian/Yugoslav aviation industry. It took over some of the hangars and equipment abandoned at the airfield after the retreat of Austro-Hungarian units. In the beginning it overhauled Serbian Aeronautics and captured aircraft and engines, but soon it began to produce complete wing assemblies and other airframe parts. From 1921 several complex conversions of aircraft then





in service were realized, and at the end of 1923 a small sample series of *Средњи Бранденбург* (SB – Mid Brandenburg, a non-licensed copy of the Brandenburg C1), were ordered and delivered during 1924. Production of that type later continued by the first two domestic factories.

On 20 November 1923 the first domestic aircraft factory, Ikarus, was established at Novi Sad. In April 1924 the first series of *Мали Бранденбург* (MB – Small Brandenburg) or *Школски Бранденбург* (ŠB – Training Brandenburg), a copy of Brandenburg B.1 primary trainers, were delivered to V KSHS. Flying and technical characteristics were equal to the contemporary foreign aircraft in the same category. That fact led to increased confidence in the aviation industry and local designers and, at the same time, opened a path for further development of aircraft in the country. In April 1924 newly formed *Преа српска фабрика авиона Живојин Рогожарски* (PSFAŽR – The First Serbian Aircraft Factory Živojin Rogožarski) from Belgrade joined Ikarus, first in production of parts and soon complete aircraft. By 1928 these two companies had delivered about 100 quality trainers and seaplanes.

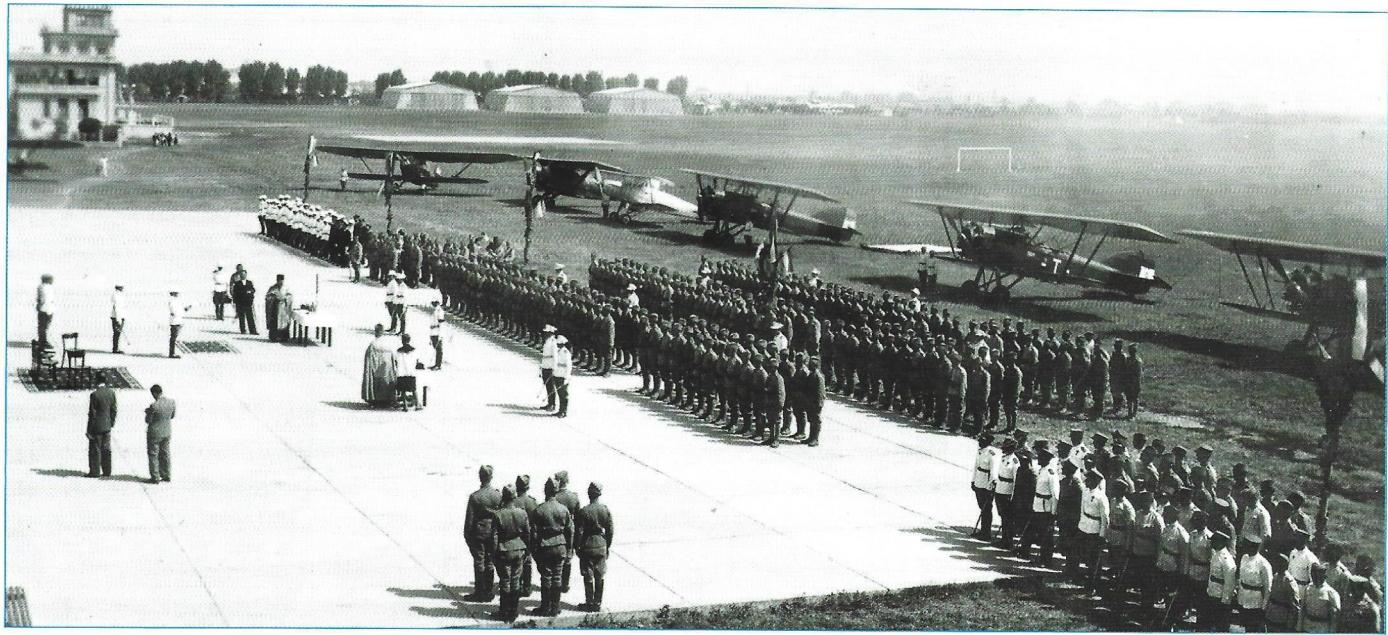
The growth of the domestic aviation industry received a significant boost when a crisis broke out in the mid-twenties in relations with neighbouring Italy. At the beginning of 1926, according to the new program of increased arming of KSHS Army, superiors in the administration and the Army decided to order, within five years, over 800 combat aircraft and several hundred trainers. Their production was mostly delegated to the local aviation industry, which thus faced major challenges by not being sufficiently prepared for independent engagement in that great and urgent work. The solution was found in license production of the then ultramodern French-designed reconnaissance/bomber Breguet 19 and Potez 25 biplane types. A new and modern factory for the production of metal aircraft was built at Kraljevo (Serbia) in 1927 and was immediately assigned to the Breguet Company. The French firm was committed to both the production of different Breguet 19 versions, with different types of engines, and training of local technicians and workers for independent production. Starting work in 1928, this factory was known as *Фабрика авиона Краљево* (FAK – Aircraft Factory Kraljevo also declared as Breguet Plant Kraljevo), and it produced 425 Breguet aircraft in six versions for VV and 45 for export.

At the same time, for strategic and production reasons, Ikarus was ordered to build a new plant in Zemun, which also was structured for modern aircraft series production. By 1932, 220 Potez 25 A2

6.VP fighters: (biplane in the middle) Avia BH-33E, (left and right from Avia) Dewoitine D.9 C1 aircraft, (far left and two on far right) Dewoitine D.1 C1s. A sole Breguet 19 biplane is in the distance. (Aviation Museum – Belgrade)



Zmaj factory hall shows plenty of overhauled aircraft during the late twenties, such as Dewoitine D.1s (two fuselages in the foreground, heavily damaged fuselage in the background and partially visible fuselage at the right side of this shot), Potez 15 A2 №531 (tail at the right side), Hanriot H.320 "White 1" (with characteristic White "trainer stripes"), LGLB (wings at the left side) and two-seat Fizir biplane (with ladder next to the fuselage). (Aviation Museum – Belgrade)



*The celebration of VV (St Illias Day): personnel and aircraft of 6.VP are lined up at Belgrade aerodrome on 2 August 1935. From right to left, three Ikarus-built Potez 25 A2s, a Silver Fury Mk.I, a Breguet-Cyclone prototype and a standard Breguet Bre 197. (Mario Raguž)*

biplanes, equipped with domestic-built IAM 9Ad Jupiter radials, were delivered from the new Ikarus plant. Up to 1931 the old Ikarus plants at Novi Sad built 37 flying boats, designated as IO (Извићач Обални i.e. Coastal Reconnaissance) and several prototypes, all indigenous-designed. During 1928 to 1929 Rogožarski built a series of 32 F.1V (Fizir-Maybach) biplane reconnaissance/trainers and by 1931, five prototypes developed from the same airframe. In addition, this company also built its own design of an advanced trainer prototype, the AŽR (АЖР) called "Blue-Yellow Bird".

At the beginning of 1927 the fourth Serbian aircraft factory, *Фабрика аероплана и хидроплана – Змај* (Aircraft and Hydroplane Factory – Zmaj), was created at Zemun. By the beginning of the thirties Zmaj had delivered 45 Hanriot H.320 primary trainers, 10 Hanriot H.41H floatplane trainers, 26 Gourdon-Lesseure LGLB fighter-trainers and three Dewoitine D.27 C1 metal fighters.

The largest effort was made when two new factories for license engine production were built at Rakovica, then on the outskirts of Belgrade, which became one of the largest industrial centres in the country. The first factory, *Индустрија аеропланских мотора* (IAM – Aero-Engine Industry), equally relied on French and domestic capital. This factory delivered 420 air-cooled 9-cylinder 420 mhp Gnôme-Rhône Jupiter radials between 1928 and 1932. The second factory, *Влајковић-Валтер* (Vlajkovitch-Walter), created in cooperation with the Czechoslovak Walter concern, produced 230 air-cooled 7-cylinder 120 mhp Walter NZ/NZR radials between 1929 and 1934. Production of those modern engines, in a country which had not even manufactured any steam engines beforehand, was a major change in the industrial, technical, technological and economic development of Serbia and the entire KJ.

## Crisis years

The rise of the domestic aviation industry lasted until 1932, when state orders stopped due to the consequences of the global economic crisis. The relatively high capacities of aircraft factories were hardly used and the number of employed workers was reduced. At these critical moments the state, as the sole buyer, ordered a small annual batch of BH-33E biplane fighters and aircraft overhauls from various factories, attempting to retain the core of professionals and specialized workers for better times. The value of the aviation industry was reflected in the large number of indigenously-designed types. The first generation of designers, who were active during the twenties, designed a number of military primary and advanced trainers and seaplanes, of which four types in 10 versions were produced in quantity.

## Renewed rise and modernization of the aviation industry

A new emergence of the domestic aviation industry began in the mid-thirties, at the time when the rise to power of the Nazis in Germany signalled that a new war was approaching. Necessary modernization of VV was again entrusted with a substantial share to the domestic aviation industry. In that new sharing of fighter orders, Ikarus adopted the production of two metal fighters, the license-built Hawker Yugoslav Fury and the indigenous IK-2, while Rogožarski delivered mixed-construction IK-3 fighters and, in addition, started work on all metal Hawker Hurricane Mk.I fighter batch. Zmaj also



produced primary and advanced trainers and was able to deliver 24 Hurricanes shortly prior to the 1941 April War. Until April 1941 all factories were gradually increasing production capacity and numbers of employees, introducing new construction technologies for series production with mixed and metal structures and accepting production of new generations of aviation instruments, various components and parts, oxygen and other equipment, parachutes, plywood and other materials necessary for modern aircraft production. Owing to the significant increase in orders and the need for assignment of ever increasing production needs, new aircraft factories were established in Serbia during that period.

Line up of nine Silver Fury Mk.II fighters at Zemun airfield. Note "Black B" under the upper wing and Black three-digit codes on the fuselages. (Aviation Museum - Belgrade)

## New indigenously-designed aircraft

The program to rely on domestic designers was particularly promoted prior to the war when, due to difficulties in procurement abroad, the Government encouraged domestic designers activity and the production of numbers of prototypes. From 1938 Rogožarski started manufacturing the legendary IK-3 fighter, and in addition in 1940 built a prototype of the twin-engine R-313 heavy fighter. During the same year Ikarus built a twin-engine all-metal *Orkan* (Orkan i.e. Hurricane) heavy fighter, Zmaj also produced a prototype of twin-engine R-1 heavy fighter-bomber. At the time of the Axis invasion, an additional prototype, the twin-engine Rogožarski IK-5 fast heavy fighter, was in the final stage of mock-up production.

In accordance with the flight testing tasks for the indigenously-designed and domestically-built aircraft, and also many foreign aircraft presented and offered to VV, a new special unit, *Ваздухопловна опитна група* (VOG – Air Test Group) was formed on 15 October 1933 at Zemun airfield. Test pilots and technicians at VOG also significantly contributed to the development of the indigenously-designed



Class photograph with the commanding officers, instructors and pilots of the 3rd Pilot School, XI Class 1938. Note the Hurricane in action drawing as an illustration. (Djordje Nikolic)



*The first aircraft delivery from the Third Reich to the Kingdom of Yugoslavia: four Messerschmitt Me-108 trainers (Bf 108B-2 Br.1/Š-01 to Br.4/Š-04) and five Messerschmitt Me-109 fighters (Bf 109E-3a Br.1/L-1 to Br.5/L-5), Regensburg factory airfield, 15 August 1939. (Franc Pirc via Marko Ličina)*

prototypes and the entire aviation industry. Before the 1941 April War, over 60 different domestic and foreign-built aircraft were tested by VOG. In addition pilots and engineers from this Group carried out over 400 acceptance tests for aircraft produced or overhauled within local factories and air depots.

## VV fighter units

The first fighter unit in the newly formed V KSHS was *Ловачко аеропланско одељење* (Fighter Aeroplane Detachment) equipped with Spad fighters. It was established in the autumn of 1919 at Niš airfield as an independent unit reporting directly to the *Ваздухопловна команда* (VK – Air Command). This unit was disbanded in March of 1921.

In November 1923 *Ловачка ескадрила* (LE – Fighter Escadrille) was established within 1.VK from Novi Sad. All fighters from Army *escadrilles* were gathered and assigned to it. This unit was reformed in November 1924 as 5.LE and was included in the composition of the also newly-formed *1. Извиђачка група* (IG – Reconnaissance Group) from 1.VK. In June 1926 10.LE was established, which (together with 5.LE) entered the ranks of the 2.VG (*Ваздухопловна група* – Aviation Group) from the newly formed 1.VP at Novi Sad airfield.

In the spring of 1927, two new air groups, 121.VG (ex 2.VG) and 125.VG, were established within 1.VP and both were equipped with Dewoitine D.1 and D.9 fighters. Two new *escadrilles*, 271.LE and 272.LE, were assigned to 125.VG while 251.LE (ex 5.LE) and 252.LE (ex 10.LE), were assigned to 121.VG. In March 1927 125.VG was relocated to Zemun airfield and early next year from its ranks the capital city's 6.VP was established.

At the beginning of 1928 *Ловачка пилотска школа* (LPŠ – Fighter Pilot School) 6.VP was established at Zemun airfield and it was equipped with various types of fighters and training aircraft. In May 1929 127.VG was established, which was the second group within 6.VP, and it constituted of two *escadrilles*, 281.LE and 282.LE, with two seat Potez-Hispanos. At the beginning of 1932 274.E was established as the third *escadrille* within 125.VG.

By the end of 1936 VV had three fighter groups: 121.VG (within 1.VP), 125.VG and 127.VG (within 6.VP) equipped with Dewoitine and Avia BH-33E fighters. In April 1937 a new 126.VG was established as the third group within 6.VP, and 274.E was assigned to it (removed from 125.VG) as well as the newly formed 275.E.

With the VV reorganization, *escadrille* and group units were reformed and renumbered on 1 January 1938. The capital's 6.VP, since the day it was established, mostly used fighters and was known as *ловачки пук* (LP – Fighter Regiment). Its three groups (with respective *escadrilles*) received new designations: 31.VG (ex 125.VG) with 101.E (ex 271.E) and 102.E (ex 272.E), 32.VG (ex 126.VG) with 103.E (ex 274.E) and 104.E (ex 275.E) and 51.VG (ex 127.VG) with 161.E (ex 281.E) and 162.E (ex 282.E). In the summer of 1940 two new *escadrilles* (141.E and 142.E) were established and were assigned as third *escadrilles* within 31.VG and 32.VG respectively. The three previously-mentioned groups remained within 6.VP until 1 April 1941, when 31.VG was transferred to the newly established 2.LP. The remaining two groups, 32.VG (with Me-109) and 51.VG (with IK-3 and Me-109), entered the war within 6.VP.

Novi Sad based 1.VP even after 1 January 1938 retained its fighter 34.VG (ex 121.VG) with two *escadrilles*, 107.E (ex 251.E) and 108.E (ex 252.E). On 1 May 1939 1.VP became 1. бомбардерски пук (BP – Bomber Regiment) and its 34.VG was transferred within Zagreb's Regiment which on the same day became 4.LP.

With the reorganization from 1 January 1938 Zagreb's 4.VP received fighter 33.VG (ex 4.IG) with 105.E (ex 4.E) and 106.E (ex 81.E). As of 1 May 1939 34.VG also joined the ranks, the Regiment was renumbered to 4.LP and entered the war with the same formation.

52.VG (ex 233.VG) was formed within the Mostar based 7.VP with 163.E (ex 407.E) and 164.E (ex 408.E). 52.VG did not exist at the time as a fighter unit because there were no twin engine fighters.

That group was transferred on 1 April 1941 to 2.LP, which was at the time undergoing rearming with domestically-built Hurricanes.

5.VP was established at Niš on 1 April 1939 as a new unit, and 21.IG (ex 1. Autogyro Group) was assigned to it with three *escadrilles* (41.E, 42.E and 43.E) as well as the new 35.VG with two new *escadrilles* (109.E and 110.E). In the autumn of 1940 this Regiment was reformed as 5.LP and on 1 March 1941 from 21.IG a new 36.VG was established with two new *escadrilles* (111.E and 112.E).

Due to the delays in the delivery of domestic Hurricanes, 2.LP was established as late as 1 April 1941 at Zemun. 31.VG (from 6.LP) and 52.VG (from 7.BP) were assigned to it.

LPŠ 6.VP in Zemun was reformed on 1 January 1938 as 3.PS (Pilot School) and in the spring of 1938 it relocated to Niš.

## VV in World War II

After World War II broke out on 1 September 1939, the political situation in Europe changed completely and the war approached KJ's borders. All Yugoslav military orders were seriously jeopardized and the re-arming process was appreciably slowed and not completed by the time of the Axis attack. Allied aid to Yugoslavia did not exist during 1939-1940 because the UK and France were engaged in their own wartime operations, and also supplied military material to Greece, Romania and Finland.

For KJ World War II started on 6 April 1941, a year and seven months after German aggression against Poland. The military *coup d'état* of 27 March 1941 and anti-German demonstrations in Belgrade and other towns clearly aligned KJ with the Allies. During the same day, a very angry Hitler immediately ordered the implementation of *Unternehmen 25* (Operation 25), an attack against KJ. Simultaneously, he secured the participation of Italy in this campaign while Hungary, Romania and Bulgaria gave active or passive support in exchange for territorial claims in Yugoslavia. Germany simultaneously started *Unternehmen Marita* (Operation Marita), an earlier planned attack on Greece, which was at war with Italy since 28 October 1940.

### VV Fighter Units Order of Battle 6 April 1941

Aviation Brigade, Pilot School	Fighter Regiment	Aviation Group	Escadrille	Aircraft type	Location
1.VB	6.LP	32.VG	103.E	Me-109	Krušedol, Veliki Radinci, Bijeljina
			104.E		
			142.E		
	51.VG	102.E	Me-109 IK-3 Potez 63	Zemun, Veliki Radinci	
		161.E			
	2.LP	162.E			
	2.VB	105.E*	Hurricane	Veliki Radinci	Sušičko Polje
		31.VG	101.E 141.E		
		52.VG	163.E 164.E	Hurricane	Kraljevo, Knić
		33.VG	106.E	Hurricane	Bosanski Aleksandrovac
	4.LP	34.VG	107.E 108.E	IK-2 Hurricane	Bosanski Aleksandrovac
		35.VG	109.E 110.E	Fury	Bojnik, Kosančić
	5.LP	36.VG	111.E 112.E	Fury	Režanovačka kosa
3.PS	-	-	-	Hurricane Me-109 Avia BH-33E	Kosor-Mostar

\* transferred and relocated from 4.LP 33.VG to 6.VP

During the April War VV used a total of 401 front line combat aircraft. Of those 149 were fighters, 108 were modern low-wing monoplanes (55 Me-109s, 44 Hurricanes, one LVT-1, eight IK-3s), 38 obsolete aircraft (25 Furies, 10 IK-2s, three Avia BH-33Es) and three twin-engined fighters (two Potez 63s and an Me-110). Before any declaration of war, the *Luftwaffe* attacked on 6 April around 04:30. According to the scenario already proven in previous campaigns in Europe, the first attacks were directed against



14 Me-109 fighters with temporary German civil registrations prepared for the ferry-flight to the Kingdom of Yugoslavia, autumn 1939.

(Aleksandar Smiljanic)

the military airfields belonging to the Yugoslav fighter and bomber units which were located along the main directions of the *Wehrmacht* advance into KJ. A total of 58 combat aircraft and 20 trainers were destroyed at those locations. The first air combats were conducted over the airfield of the 5.LP 36.VG near Kumanovo, where 11 Fury fighters were shot down and three were damaged, killing seven and wounding four VV pilots. In those combats two German fighters were shot down and one was severely damaged.

Hitler specifically ordered an attack on the capital city, Belgrade, which had to be punished for the events from 27 March. The attack was carried out under the codename *Unternehmen Strafgericht* (Operation Punishment). For that operation the Germans directed the bulk of the *Luftwaffe* forces which were concentrated in Austria, Hungary and Romania for the war against KJ. The attack orders dictated bombing of military and many civilian targets and thus destroying much of the city and terrorizing its population. The first attack began at 06:50 with 234 Heinkel He 111, Junkers Ju 88 and Dornier Do 17Z twin-engine bombers and Junkers Ju-87 *Stuka* dive-bombers escorted by about 120 Messerschmitt Bf 109E-4/7 and Bf 110C/D/E fighters. During the second attack, between 10:00 and 11:00, 57 *Stukas* and 61 fighters took part, the third attack was carried at about 15:30-16:00 by 94 twin-engine bombers and *Stukas* escorted by 40 fighters, while the fourth attack, about 16:00, took place with 99 bombers and 30 escort fighters which flew in from Romania. In total 484 *Luftwaffe* bombers participated in those four attacks, and dropped over 360 tons of incendiary and high explosive bombs on the city of 380,000 inhabitants, while some fighters and *Stukas* used their cannons and machine guns to attack the refugees who were leaving the city.

Air Force aircraft and weapons on exhibition at Zemun, 27 April 1940 during the visit by H.M. King Petar II. Six modern VV aircraft are visible in the line up (from right to left): Fieseler Roda (Fieseler Fi 156C-2 Storch) "Black 7", Rogožarski IK-3

Nº2, Me-109 (Messerschmitt Bf 109E-3a) "Black

L-75", Hawker Hurricane Mk.I "White VI", Bristol

Blenheim Mk.I and Savoia-Marchetti SM-79. (City of Belgrade Library)

6.LP with its 32.VG (three *escadrilles* with a total of 22 Me-109s), which was based at the wartime airfield near the Krušedol Monastery, north of Belgrade, opposed those large German forces. 51.VG with three *escadrilles* was based at the capital airfield, one *escadrille* had 10 Me-109s and other two a total of six IK-3s and a one Potez 63. The city was also defended by 10 anti-aircraft batteries, equipped with M.28, M.36 and M.37 guns, which were situated in the suburbs while three anti-aircraft machine-gun companies were located on the top of some tall city buildings. Bitter air battles with more experienced enemy developed on the outskirts of Belgrade during the first attack and also above the city, in which the Yugoslav pilots succeeded in breaking up several groups of German bombers and shooting down several aircraft. In combatting the following attacks both 6.LP groups engaged 13 to 16 fighters, and the final balance of the first day during the Battle of Belgrade was eight shot down and 15 damaged VV fighters.

The German attacks on Belgrade continued during the night and the next day, but with less ferocity than the first day. *Stuka* attacks repeated on 11 and 12 April as tactical support to the German troops which entered Belgrade on 13 April. It is not exactly known how many enemy aircraft were shot down by VV fighters and how many by anti-aircraft batteries.





In addition to the defence of Belgrade and the mentioned battle over Kumanovo, fighter aviation participated in air combat over other parts of the Kingdom. Defending the 8.BP airfield, pilots from 4.LP, flying four Hurricanes and six IK-2s, engaged in combat with 27 German Bf 109s on 7 April above Rovine airfield near Banja Luka. Three Yugoslav and two German fighters were shot down but bombers from 8.BP were saved. 3.PS instructors from Mostar, who had four Hurricanes and two Me-109s, exhibited great combat skill between 6 to 12 April against Italian and German bombers and fighters in the wider region of Mostar. They managed to shoot down five and damage several more enemy aircraft, but they also suffered casualties. Two BH-33E biplanes fought against nine German Bf 109s on 6 April over Podgorica. That unequal struggle ended tragically for both VV pilots. A certain number of air combats took place over central Serbia in which 2.LP pilots managed to shoot down several German reconnaissance aircraft.

Because of the unfavourable situation on the front there was a real danger of the King's capture, hence the Government and the military authorities decided to evacuate by air to Greece. VV HQ collected the remaining bombers and mobilized transport aircraft at Nikšić in *Црна Гора* (Montenegro) and at surrounding airfields in *Херцеговина* (Herzegovina), and from 14 to 16 April organized an effective "air bridge". On 14 April, HM King Peter II and his escort evacuated in 81.VG Savoia-Marchetti SM-79 bomber, with fighter escort consisting of a pair of Furies from 5.LP 35.VG during the first half of the route. During 15 to 16 April, VV aircraft transported to Greece members of the Government, participants of the *coup d'etat* and other public figures, as well as the part of the Government's gold and public security bonds issued by the National Bank. Within the same operation, VV HQ succeeded in evacuating to Greece more than 40 pilots in Do-17K bombers, while several other groups and individuals arrived in Greece in other aircraft types. As a result, during the summer of the 1941 about 220 Yugoslav aviators gathered in Egypt and later continued the fight. Most VV members who remained in the country became German and Italian prisoners of war or became members of Croatian Air Force. Some of them later joined Partisan Aviation and Air Force of the new Yugoslav Republic.

With the help of available literature, eyewitness accounts and insights into the individual unit documents, it is certain that the Germans lost, temporarily or totally, 92 aircraft and that they had a further 37 damaged, whilst the Italians lost 12 and had 22 damaged and the Hungarians lost five and had three damaged aircraft. VV fighter units lost around 50 aircraft, with the loss of 28 pilots and 18 wounded. Following the end of the hostilities, German forces captured 221 aircraft and 11 fuselages, along with a large number of weapons and other equipment, of which the majority was sold to the pro-axis Croatian puppet state. The Italian forces captured further 118 aircraft and 40 floatplanes and flying boats.

*Eleven pilots and ten Me-109 fighters from 102.E 31.VG 6.VP are visible in this shot, taken at Mostar airfield on 5 April 1941. The Escadrille CO, kap Ilk Miloš Žunjić, is standing in the middle. (via Mario Hrelja)*

# Nieuport 24 C1 & 27 C1 (V KSHS Nieuport-120 KS)

## Background

The famous French sesquiplane family, Nieuport, was a synonym for fighter aircraft from the middle of World War I until the introduction of modern Spads. The Nieuport (*Société Anonyme des Établissements Nieuport*) factory from Issy-les-Moulineaux manufactured numerous fighter types, which were recognizable by the characteristic V shaped interplane struts and their rotary engines. The sesquiplane was a type of biplane whose lower wing was much narrower in chord and usually with shorter span than its top wing. Towards the end of the war, the “third generation” Nieuports, that is the Nieuport 24 and Nieuport 27, were used operationally, however these aircraft flew at the time mainly in Fighter Detachments, parts of standard Army *escadrilles* which were equipped with reconnaissance or bomber types. Serbian pilots flew almost all Nieuport types on the Salonika front.

Frenchman maréchal des logis Gaston Jackuillard, pilot of Escadrille N.523, in front of Nieuport 24 C1 with Black code 8 on the fuselage sides, 1917. (Aviation Museum – Belgrade)

Towards the end of 1916 the Nieuport 17 and 23 were becoming obsolete, especially compared to the new Spad fighters which just started arriving in the French Air Force (*Aéronautique Militaire*) service. The Spad S.7 C1 fighter was designed in accordance with a concept entirely different from the sesquiplane, but the main designer at Nieuport, Gustave Delage, considered that his design still had a future. While the Spad was designed for high horizontal speed and climb rate, partially sacrificing manoeuvrability, the Nieuport was exclusively designed around manoeuvrability. Delage decided to optimize the existing construction and kept the rotary engine. His new single-seat fighter (*avion monoplace de chasse*), the Nieuport 24, had the same construction elements as the Nieuport 17 forerunner and it

used a Le Rhône 9Jb engine. This new aircraft was a cleaned-up Nieuport 17 with fuselage faired stringers and new empennage. The new type passed the official testing at the *Section Technique de l'Aéronautique* (STAé) during 15, 16 and 19 February and 17 March 1917. Since it was determined that it possessed better performance than its predecessor, the Nieuport 24 was accepted for series production.

The first model to be produced was the Nieuport 24bis (Nie 24bis C1) while the Nieuport 24 (Nie 24 C1) followed a little later. Both sub-variants had the same fuselage as the Nie 17bis and the wing surface area of 15 m<sup>2</sup>, but the Nie 24bis also retained the tail assembly from its predecessor while Nie 24 C1 received an entirely new one. As a result, Nie 17bis and Nie 24bis types had almost no external differences. Nie 24bis was produced in smaller quantities.

By May 1917, some two months after the trials, the production of the Nie 24 C1 was in full swing. However,



in operational service this type was a big disappointment, because in June of the same year a number of French and British pilots filed reports concerning poor roll control due to difficult to operate ailerons. As a result, the British allowed the use of this type only for training. Luckily, the factory discovered the problem and eliminated it with a minor change during August and September 1917. The problem occurred due to a hardened tape which was used to cover the space between the wing and the aileron. After the modifications, Nie 24 C1 regained its expected manoeuvrability.

At the time it was introduced into service between May and July 1917, the first “third generation” Nieuport, Nie 24 C1, was already obsolete as a fighter. Since large quantities of rotary engines were available, it was manufactured in large numbers. It differed from the Nieuport 23 in having a new fuselage and tail. It remained in front-line units on the Western front for a very short period of time, but it was intensively used in secondary war zones.

Soon after the introduction of the Nieuport 24 a new aircraft, the Nieuport 27, took off and it was the last type which used the usual sesquiplane design characteristic of the Nieuport aircraft family. The Nieuport 27 was introduced into service in June 1917 and the number of these aircraft by the summer of 1917 significantly exceeded the number of Nieuport 24 and 24bis. This type also had problems with roll control which was solved in the same manner as in the previous versions. During the autumn of 1917 the Nieuport 27 began significantly falling behind the newer German fighter types. As a result, the French decided to equip fighter *escadrilles* by the spring of 1918 with new Spad fighters. This could not be fulfilled in time due to technical problems with the Spads, hence by the end of January there was a shortage of 26% of the required Spad fighters in service. As a result, Nieuport 27 service at the Western front was extended until April 1918 and in the other war zones until autumn. While still at the front lines, Nieuport fighters were used as trainers by the French and the Americans. The majority of newly produced aircraft were immediately transferred to training units.

The Nieuport 27 C1, the third of the “third generation” Nieuports, differed only in small details from the previous Type 24. Already at the time when it appeared in mid-1917, it was obsolete as a fighter type in French and British *escadrilles*/squadrons on the Western front, and as of spring 1918 it was replaced by modern Spad fighters. At the beginning the Nieuport 27 was equipped with a 9-cylinder Le Rhône 9Jb rotary engine which was rated 120 mhp at 1,300 rpm at sea level. In the later period, some machines received the similar Le Rhône 9Jby rotary engine. The Americans used around 120 aircraft for training and the Italians used them in combat.

A total of 7,200 Nieuports in eleven main versions (Nieuport 10, 11, 12, 16, 17, 17bis, 21, 23, 24, 24bis and 27) were produced at the main and French subsidiary factories. They were mostly powered by the Le Rhône engines. Italy produced mostly older versions under license (856 aircraft), while Japan, Netherlands, Russia (about 600) and UK produced them as well, which brings the total number of aircraft to around 9,000. Apart from these countries, Nieuports were used in Belgium, Greece, Serbia and USA. After the war, Nieuports flew in many other countries and between 1920-1923 the Russians produced 140 Nieuport 24s.



Commanding officer of Escadrille AR.522 from Aéronautique Serbe, lieutenant Alexandre Guibert in front of Nieuport 24 C1, Vertekop airfield, late 1917. (Aviation Museum – Belgrade)

## In Serbian and Yugoslav Service

Serbian Air Service at the Macedonian front (*Front d'Orient*) or *Српска авијамика* (Serbian Aeronautics), also known as *Aéronautique de l'Armée Serbe* (Aeronautic of the Serbian Army – SA) used almost all Nieuport types from its creation in 1916.

Until the spring of 1918, the Nieuport 24 was the most modern fighter at the Salonika front. Aircraft of this type served in “Nieuport” *escadrilles*, two French (N.506 and N.507), one Hellenic (N.531) and one Serbian (N.523). According to the rules, each bomber *escadrille* was assigned a pair of these

Nieuport 24 C1 of Aéronautique Serbe crashed on 11 January 1918: (top) Serbian officers in front of crashed fighter, standing in the middle is pilot capitaine (kap) Živojin Stanković, chief of Aeroplane Depot; (bottom) Serbian soldier guards remains of the aircraft. (both Aviation Museum - Belgrade)



fighters. From the spring of 1918 Nieuport 27 C1 fighters began flying at the Salonika front. During 1918 Nieuports were replaced in the fighter *escadrilles* at the Salonika front but they remained in the bomber *escadrilles*.

At the time of the Salonika front breakthrough, SA had a total of 10 Nieuport fighters used to support the Army, divided between two SE (српска ескадриља – Serbian Escadrille). Seven were in 2.SE (AR.525) and three in 1.SE (AR.521). With the French Aéronautique de l'Armée d'Orient (Aeronautics of the Eastern Army) at the Serbian front there were a total of six aircraft, three each in *Escadrille №502* and *№505*. According to some assumptions, 10 Serbian aircraft were Nie 24 C1 type and six French were Nie 27 C1. The majority of these aircraft arrived in the liberated Serbia and participated in combat until the very last day. Serbian units were transferred after the war to Novi Sad airfield. All surviving Serbian Nieuports joined the newly formed V KSHS in 1919 while the French ones followed later on.

The total number of Nieuports in V KSHS service was around 10. Most likely (according to the available photos) there were three Nieuport 24 and seven Nieuport 27, which corresponds to the number of Nieuports within SA which arrived at Novi Sad. The number of aircraft by types was deduced from the fact that Nieuport 24s were painted Silver while Nieuport 27s mainly wore a camouflage scheme.

Flying in Nieuport 27 N5773 at Novi Sad, the acting Air Force Commander, *maj* Branko Vukosavljević, died on 19 June 1919. A second catastrophe took place on 25 September 1922 at the same airfield when, flying Nieuport 27 N5778, Pilot School Commander *kap* Antun Povrzanović died. Nieuports were mostly used as fighter trainers at Novi Sad. They served until 1922, when they were taken out of V KSHS service. The reasons for their removal from service were frequent malfunctions, crashes, two fatalities and the introduction of a large number of Spads.



Lieutenant (por) Miodrag Tomić, fighter pilot of Escadrille N.523, pictured after return from a mission, Vertekop airfield, spring 1918. Note standard French roundels and Serbian tricolor on fuselage and absence of code and s/n. (Aviation Museum – Belgrade)



First CO of 1.SE (1<sup>re</sup> Escadrille Serbe), French lieutenant of Serbian origin, Mihailo Michel Marinković presents the Croix de Guerre to pilot por Milorad Veselinović in front of unit personnel. In the background are Dorand AR 1 A2 AR1867 and two Nieuport 24 C1 fighters which belonged to that unit. (Aviation Museum – Belgrade)

## Markings and camouflage

### Designations

Nieuport Type 24 and Type 27 fighters were officially designated by STAé as Nie 24 C1 (Nie XXIV C1) and Nie 27 C1 (Nie XXVII C1). These fighters were known as 15-meter Nieuports (*Nieuports de 15 mètres*) which was related to the wing surface area (also as Nie 17, 17bis, 21, 23, 24bis and 27).

In Serbian aeronautical jargon (also in V KSHS) both types were called *Nieuop-120 KC* (Nieuport-120 KS) which corresponded to the engine power. Some documents also mention Nieuport-110 KS, which is not strange since Le Rhône engines with 110 mhp existed, and these evidently powered at least some of the Serbian/Yugoslav Nieuports.

### Serial numbers

Nieuport aircraft carried standard serial numbers on the tail (in the form Nxxxx) which were assigned by STAé. These serial numbers were retained in service within V KSHS. Known serial numbers are: N4408, N5515 (both Nie 24 C1) and N5926, N5932, N5773, N5778 (all Nie 27 C1).

### Camouflage schemes

Nieuport fighters in V KSHS service were used with their original colours. Nieuport 24 aircraft were factory finished in overall Light Silvery Grey. Wing struts and tail skid assembly were in natural wood colour and the undercarriage legs and cabane struts were natural metal.

During the early period of use, Nieuport 27s also had the same colours. After October 1917 these fighters received a new camouflage consisting of five-colour patches on the upper surfaces, according to the newly adopted standardized multi-coloured scheme by the French Air Force. These colours were *Vert Foncé* (Dark Green), *Vert Clair* (Light Green), *Brun* (Chestnut Brown), *Beige* (Beige) and *Noir* (Black). The under surfaces were painted in Light Yellow or Light Grey. The patterns were standardized for different manufacturers.

### Markings and inscriptions

During SA service, Nieuport fighters carried standard French roundels (outer Red-White-Blue) in six wing positions (on the upper and under surfaces of the upper wing, and on the under surfaces of the lower wing) and vertical stripes with French tricolour over the entire rudder surface. From the beginning of 1918 Serbian aircraft began carrying the newly adopted large Serbian tricolour on fuselage sides.

Shortly before the breakthrough at the Salonika front, some aircraft of the SA (including Nieuport 24 and 27) introduced new Serbian roundels in two forms, (from outward to inward) Red-Blue-White or White-Blue-Red colours. It appears that Nieuport fighters carried the same markings (French or Serbian roundels) until the end of their service in V KSHS. There are no known Nieuports with chevron insignia.

Large Red or Black code numbers were sometimes applied on fuselage sides. Black serial numbers in two rows (N and 4-digit number) were carried over the upper half of the White tail stripe, while sometimes two service weights were placed below them in four rows: *POIDS UTILE 120<sup>K</sup>* (useful weight 120 kg) and *COMBUSTIBLE 65<sup>K</sup>* (fuel weight 64 kg). On both fuselage sides, near the lifting hard point, the title *LEVER ICI* (lift here) was applied. The type and serial numbers were stencilled on different parts of the aircraft such as the wings, ailerons, struts and others.

### Aircraft Characteristics Nieuport 24 C1 (V KSHS Nieuport-120 KS)

Quantity used:*	10
Crew:	1
Years of Service:	1918-1922
Span:	8.2 m (26.9 ft)
Length:	5.9 m (19.2 ft)
Height:	2.4 m (7.9 ft)
Wing area:	14.8 m <sup>2</sup> (159 ft <sup>2</sup> )
Engine:	One 120 mhp Le Rhône 9Jb rotary
Empty weight:	355 kg (783 lb)
Loaded weight:	547 kg (1,206 lb)
Maximum speed:	176 km/h (109 mph) at sea level
Service ceiling:	6,900 m (22,640 ft)
Climb to 5,000 m:	21 min 25 s
Endurance:	2 h 15 min
Armament:	One synchronized 7.69 mm Vickers M.1909 machine gun

\* total of two Nieuport types, Nie 24 C1 and Nie 27 C1

### Aircraft Characteristics Nieuport 27 C1 (V KSHS Nieuport-120 KS)

Crew:	1
Years of Service:	1918-1922
Span:	8.2 m (26.9 ft)
Length:	5.9 m (19.2 ft)
Height:	2.4 m (7.9 ft)
Wing	14.8 m <sup>2</sup> (159 ft <sup>2</sup> )
Engine:	One 120 mhp Le Rhône 9Jb rotary
Empty weight:	380 kg (838 lb)
Loaded weight:	585 kg (1,290 lb)
Maximum speed:	172 km/h (107 mph) at sea level
Service ceiling:	6,850 m (22,500 ft)
Climb to 5,000 m:	21 min 30 s
Range:	250 km (155 mi)
Endurance:	2 h 15 min
Armament:	One synchronized 7.69 mm Vickers M.1909 machine gun



A half dozen Nieuport 24 C1 fighters from 1.SE during the serious preparations for the September offensive. Note Serbian cockades on the wings and Serbian tricolor on the fuselage on the first machine in the row. (Boris Ciglić)

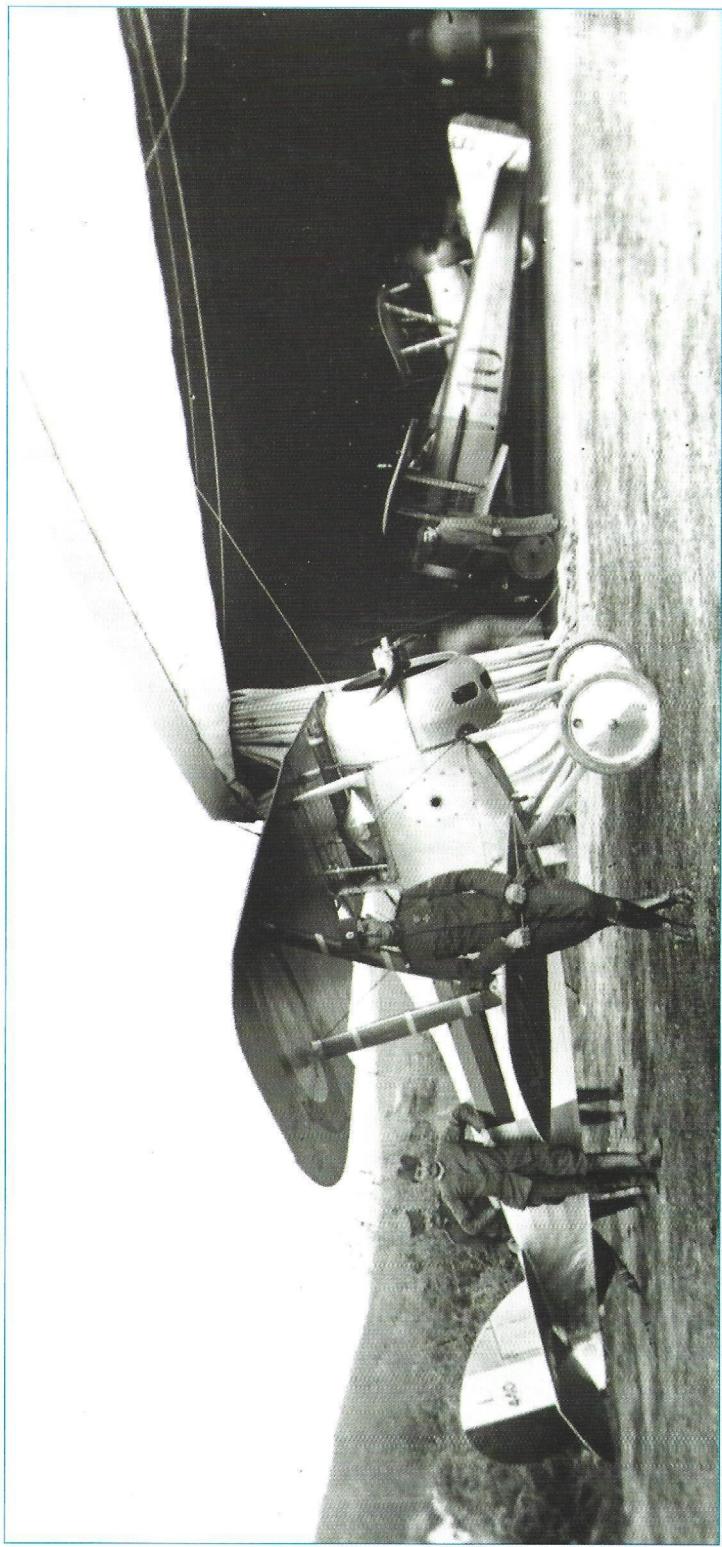
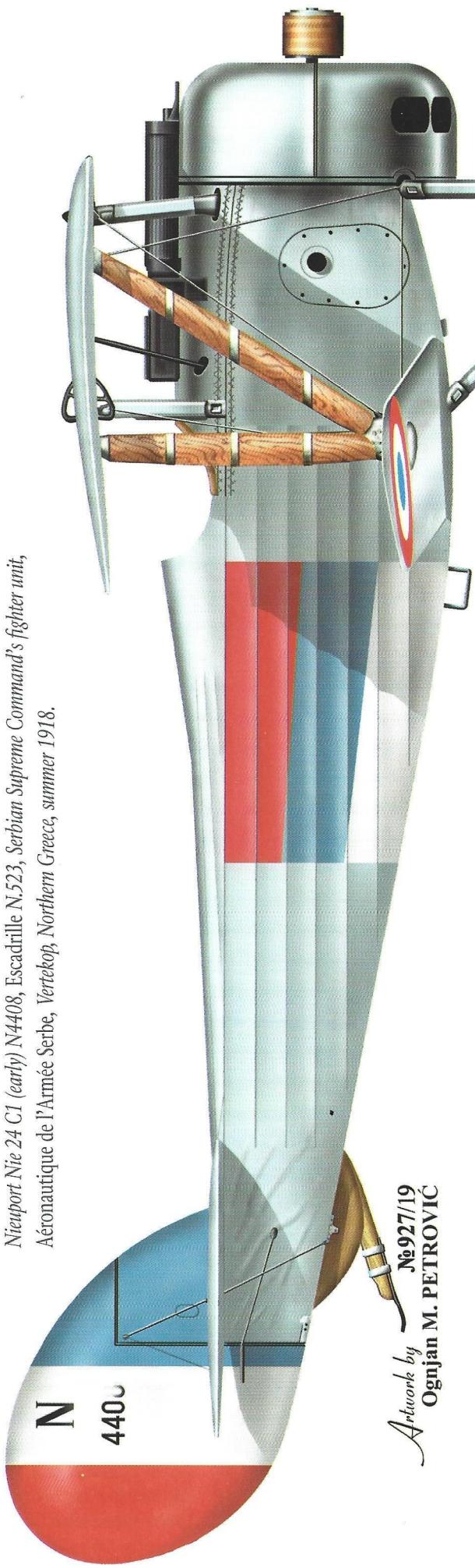


Pilot adjutant (nar) Orestije Krstić from 1.SE in the cockpit of a Nieuport 24 C1 with Serbian flag and Red 1 on the fuselage. This pilot had 183 hours of combat flying by the time of the Armistice. (Aviation Museum - Belgrade)



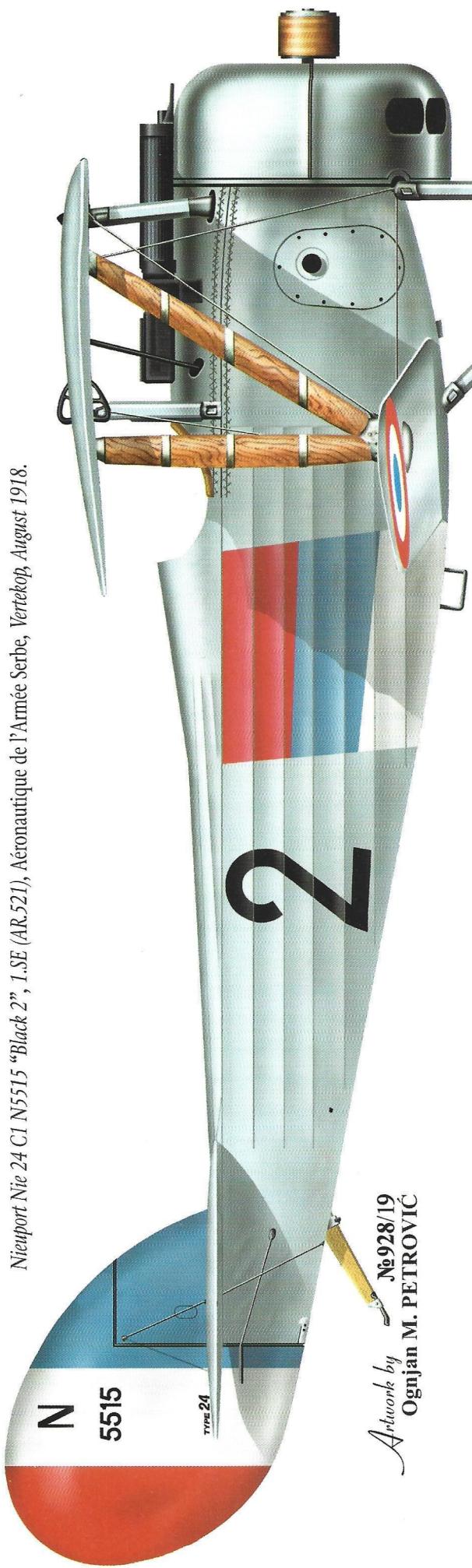
Nieuport 27 C1 of 1.SE had a minor accident at Novi Sad. Note Red/Blue/White Serbian roundel below the upper wing. (Milan Micevski)

Nieuport Nie 24 C1 (early) N4408, Escadrille N.523, Serbian Supreme Command's fighter unit,  
Aéronautique de l'Armée Serbe, Vertekop, Northern Greece, summer 1918.



Serbian fighter pilot Miodrag Tomic with his  
mechanic poses in front of N4408 at Vertekop.  
Spad S.7 C1 Black 10 is visible in the Bessonneau  
hangar (Aviation Museum – Belgrade)

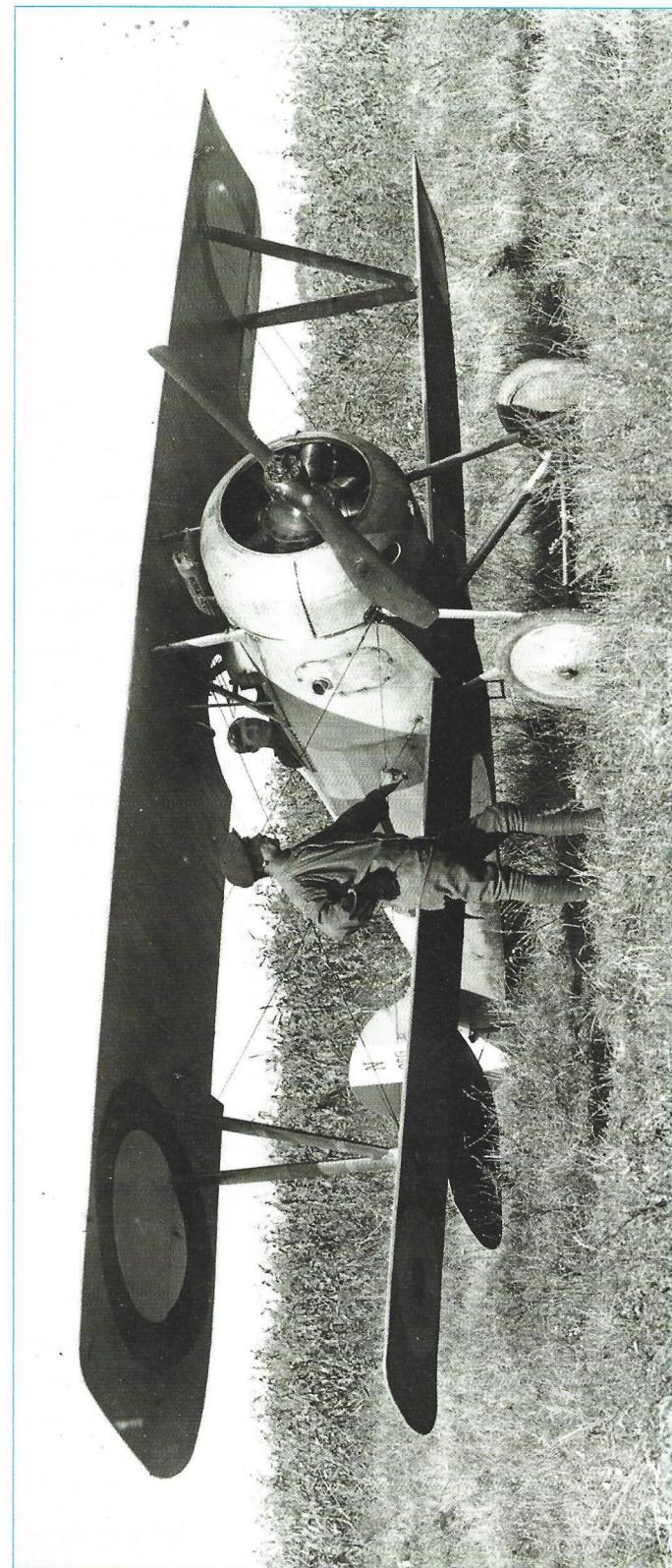
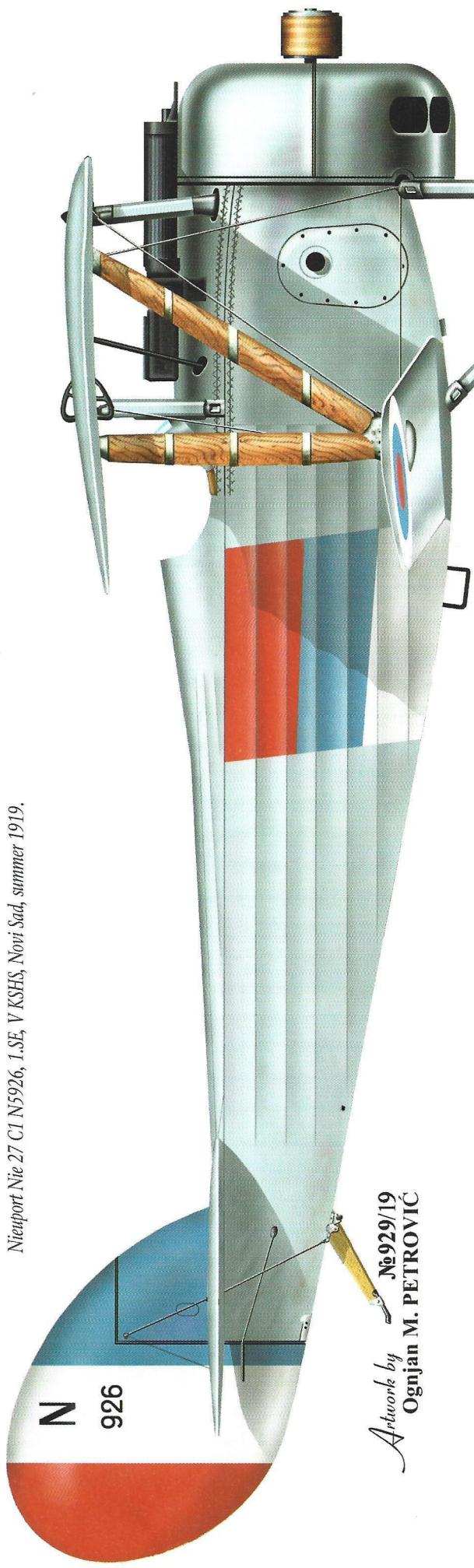
Nieuport Ni 24 C1 N5515 "Black 2", 1.SE (AR521), Aéronautique de l'Armée Serbe, Vertekop, August 1918.



Two shots of N5515: (left) nar Petar Peški-Petrović, leaning on the fuselage near Vertekop airfield, after a crash in June 1918. One of the oldest Serbian mechanic, Todor Želić, stands in the foreground. The machine was later repaired. (right) Por Milutin Mihajlović sitting in the cockpit, Vertekop, spring 1918 (both Aviation Museum – Belgrade)

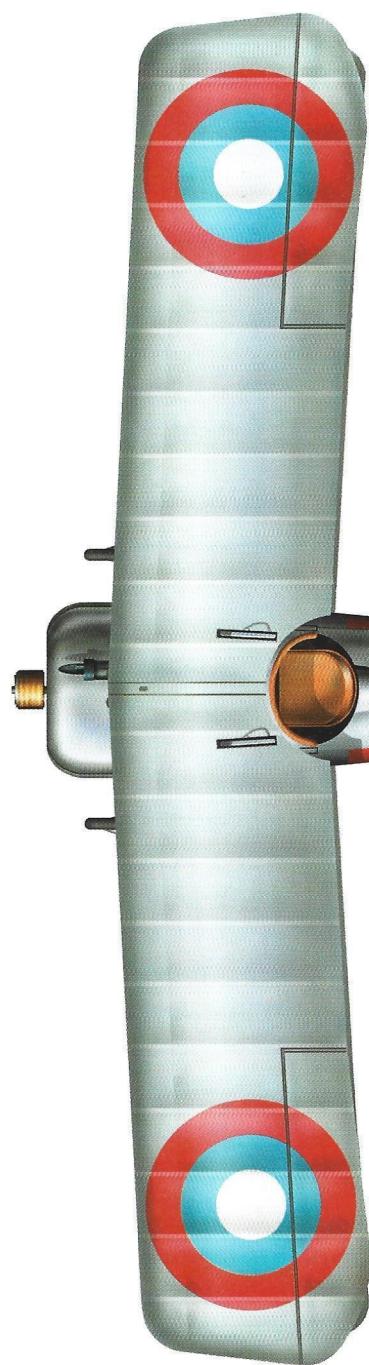


Neuport Nie 27 C1 N5926, 1.SE, V KSHS, Novi Sad, summer 1919.



Petar Petrović-Peskir in the cockpit of N5926 at Novi Sad during the summer of 1919. He completed more than 230 hours of combat flying during the Great War. Mechanic Milisav Jefić stands in front of the starboard wings. Note a combination of Red/Blue/White (undersides of upper wings) and White/Blue/Red (undersides of lower wings) Serbian cockades. (Aviation Museum - Belgrade)

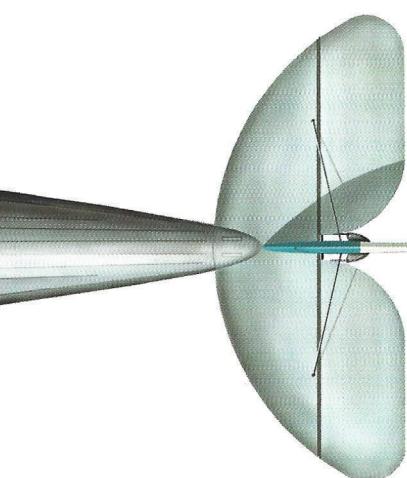
Two plan views of Ni 27 C1 N5926 clearly show the newly introduced and short lived Serbian roundel-style national insignia with two ways of colour order. Four roundels on the upper wing retained original French outer Red ring, while the other two colours changed places. Two under side roundels on the lower wings had White/Blue/Red colours.



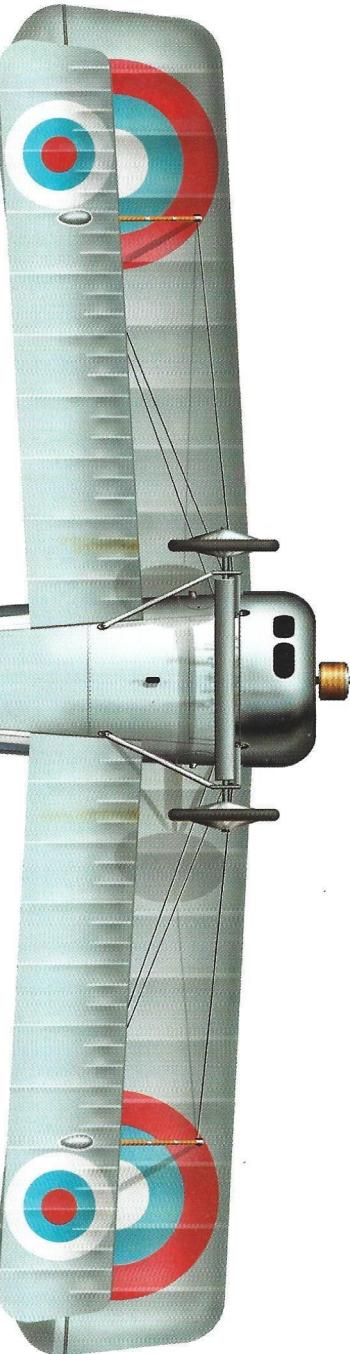
*Artswork by*  
Ognjan M. PETROVIC  
Nº930/19



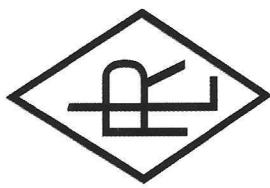
Société Anonyme des Établissements Nieuport logo.



*Artswork by*  
Ognjan M. PETROVIC  
Nº931/19

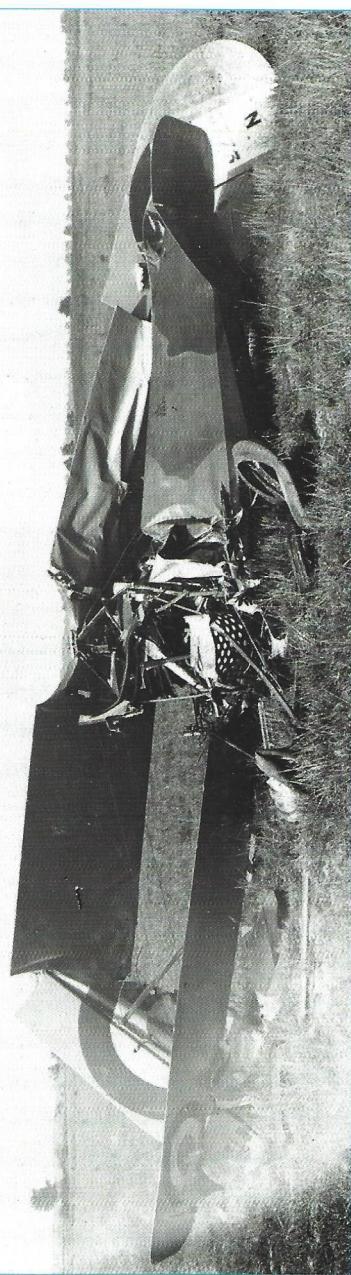
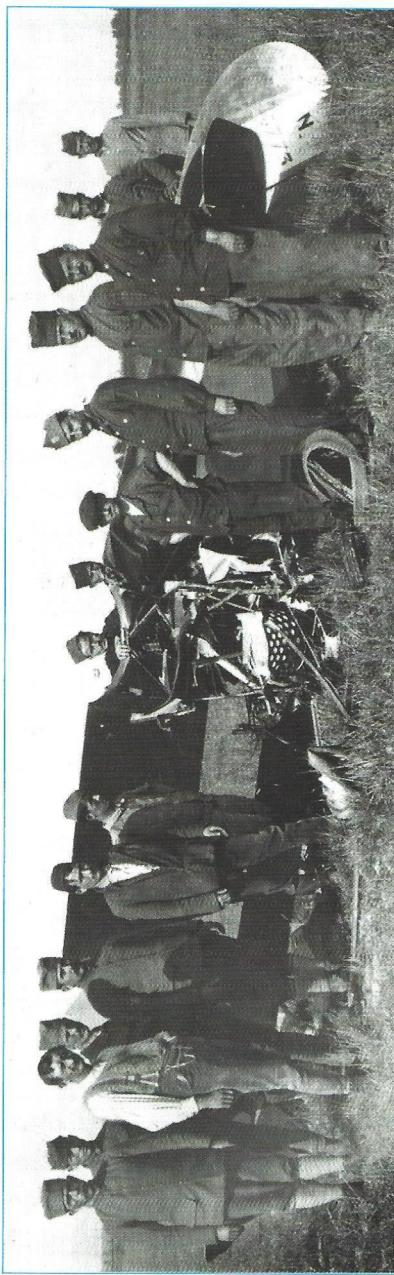
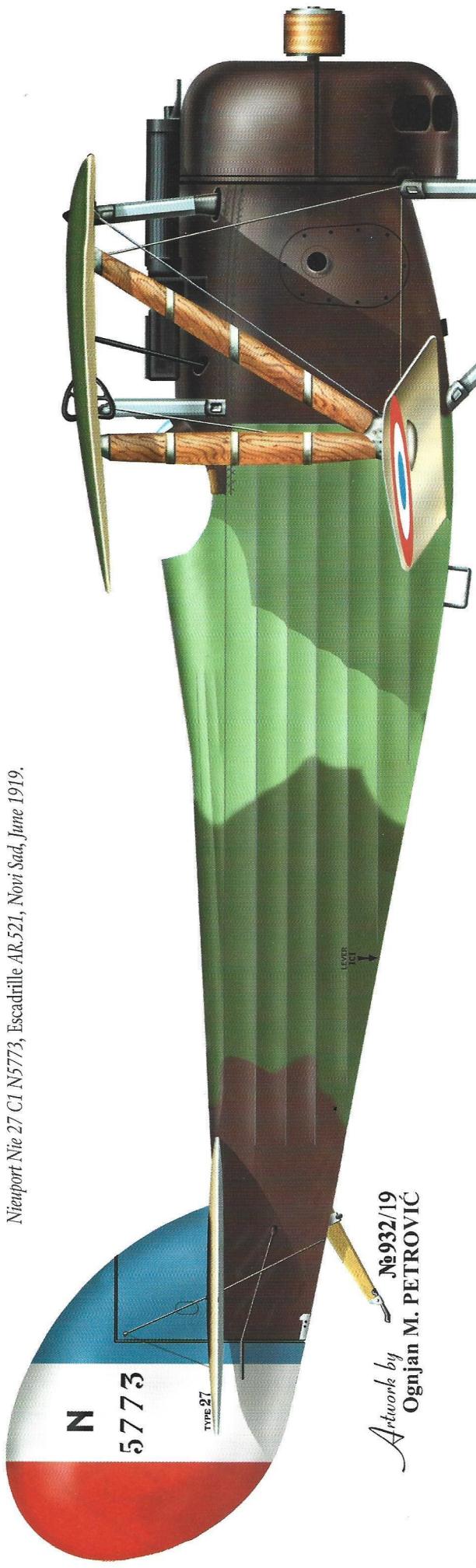


*This machine had late standard Nieuport camouflage livery.*  
Light Grey with Silver shade overall.



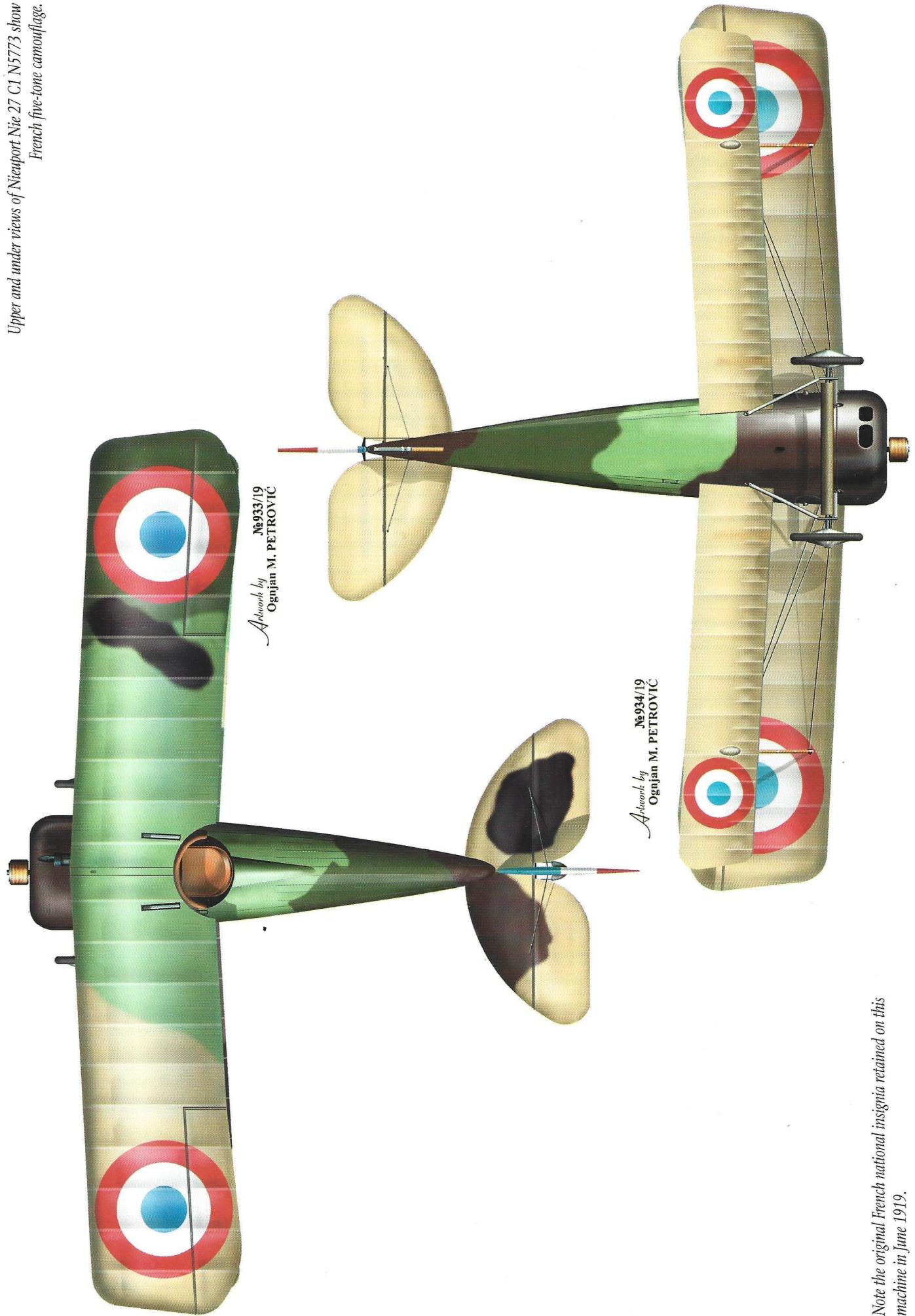
Le Rhône logo.

Nieuport Nie 27 C1 N5773, Escadrille AR 521, Novi Sad, June 1919.



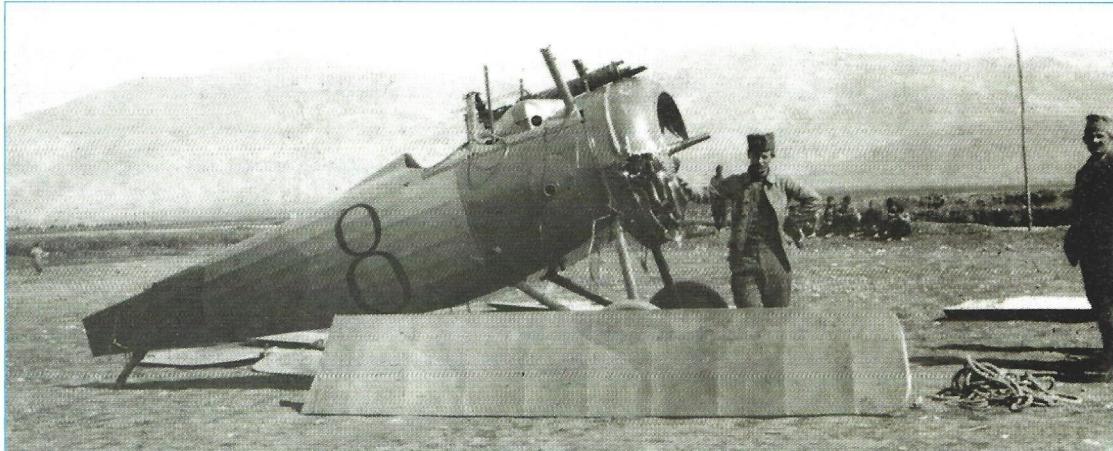
Serbian veteran, pilot maj Ranko Vukosavljević, the leading officer of newly formed Air Force, lost his life when his Nieuport 27 C1 N5773 crashed on 19 June 1919 at Novi Sad airfield. After a sharp climb, the machine lost speed, flipped over its side and hit the ground: (top) remnants of N5773; (bottom) mechanics next to the broken fighter. (both Aviation Museum – Belgrade)

Upper and under views of Nieuport Nie 27 C1 N5773 show  
French five-tone camouflage.



Note the original French national insignia retained on this  
machine in June 1919.

Camouflaged  
Nieuport 27 C1 (coded  
Black 8) from Escadrille  
N.523, with damaged engine  
cowling and dismantled  
wings (Aviation Museum –  
Belgrade)



Aircraft of V KSHS at Novi  
Sad airfield, summer 1919.  
Nieuport 27 C1 (probably  
N5926) of 1.SE is in the  
foreground. In line behind are  
eight Brandenburg B.I and  
two C.I biplanes (all from  
war booty) and two AR 1  
A2s (Šime Oštrić)



Nieuport 27 C1 N5778 of  
1.SE, Novi Sad, summer  
1919. Kap Antun Povrzanović,  
ex k.u.k. LFT member,  
lost his life flying this  
machine on 25 September 1922  
at Novi Sad (Šime Oštrić)

Two aviators (on the right  
is nar Dragutin Balzareno  
in civilian clothes, on the  
left nar Nikola Sekulić)  
pictured in front of V KSHS's  
Nieuport 27 C1 in a hangar  
at Novi Sad aerodrome,  
November 1920. Note the  
dismantled weapons and  
gun sight on the camouflaged  
machine, with French  
roundels and White stylized  
bird on the fuselage side. In  
the background there are two  
Spad fighters (the one on the  
right is S7190), one Aviatik  
(Berg) D.I (at the right side of  
the photo) and a dismantled

Nieuport rudder. There are  
original French inscriptions  
on the Nieuport: LEVER on  
fuselage side (while ICI was  
erased) and TYPE 27 at the  
root of the wing strut (Josip  
Novak via Robert Čopek)



# Spad S.7 C1 and S.13 C1 (V KSHS Spad 180 KS and Spad 220 KS)

## Background

One of the most famous and, according to many the best, single-seat World War I fighter aircraft, the Spad, was a product of the factory which bore the same name. Well chosen construction, high quality, modern V-8 Hispano-Suiza engine as well as the synchronized machine gun firing through the propeller, enabled the Spad to become one of the main Allied aircraft types during the last two years of the war. According to its flying and fighting characteristics, the Spad represented the pinnacle of aircraft design and aeronautical industry technical abilities during World War I.

Serbian pilots acquainted themselves with this fighter in May 1917, when Spads entered service within SA, more specifically its fighter *Escadrille N.523*, which up to that point was armed with Nieuport fighters. By the end of August 1918, the unit was completely converted to Spad fighters and was renamed *Escadrille Spa.523*. During the breakthrough at the Salonika front, it took part along with the French *Escadrilles Spa.506* and *Spa.507* in directly supporting the Serbian Army.

Spads were the sole fighter type in the V KSHS from 1918 to 1926 until the next generation fighter aircraft, French Dewoitine D.1 C1, was introduced. From 1926 to 1932 Spad S.7, or Spad 180 KS (Serbian: KS – коњска снага = mhp – metric horse power) as the type was known in Serbian and Yugoslav service, served in the role of a standard fighter trainer. However, from 1929 it was gradually replaced by the specialized Gourdou-Leseurre LGL B3 fighter trainer. In total, V KSHS saw a total of 32 aircraft in service, 27 Spad S.7s and five Spad S.13s.

## Spad S.7 Development

Following the bankruptcy of the French aviation pioneer Armand Deperdussin, his factory SPAD (*Société provisoire des Aéroplanes Deperdussin*) was acquired in August 1914 by the industrialist Louis Blériot. He created a new company with the same SPAD or Spad acronym but with a different meaning



CO 1.SE (Serbian Escadrille, alias AR.521) kap Ik Branko Vukosavljević, who will have one of the hangars at Novi Sad named after him, in front of Spad S.7 C1 S3384 at Vertekop airfield in the summer of 1918. Note a new panel with 18 louvers between the wings, added in field conditions in Greece as a serious cooling improvement. (Šime Oštrić)

Kap IIk Miodrag Tomić,  
Chief of the Fighter  
Aeroplane Detachment, in  
front of his Spad S.7 C1 at  
Niš airfield near the fortress  
in the autumn of 1919.  
(Miodrag Tomić)



Despite this photograph with kap IIk Miodrag Tomić, CO of 1<sup>st</sup> Air Command's PS, being taken on 26 January 1923 (as written on the back of the photo), this Spad still carries the original French five-tone camouflage and French roundels. Note the Nieuport-style windscreen and roundel on the fuselage side, according to the post-war French rules. Fuselage roundel, atypical for Serbian Aeronautics, suggest that the machine earlier belonged to Spa.507. (Dejan Milojević)

(Société Pour l'Aviation et ses Dérives). The new company acquired the entire factory team and talented chief engineer Louis Béchéreau, who during the first years of the second decade of the 20<sup>th</sup> century, proved himself by designing a multitude of successful Deperdussin monoplanes, which broke world speed records in 1912 and 1913.

As of 1915, the second year of World War I, the balance of fighting changed sides frequently. It also became clear that the Allied forces did not have appropriate fighter aircraft types in service, which match the German Fokker monoplanes. During the same year, the chief of the Spad design team, engineer Béchéreau, designed a new fighter biplane. Its construction was based on the previous tractor biplane Spad V, the forerunner of Béchéreau fighter family. With the understanding that rotary engines had peaked in their development, Béchéreau chose a new water-cooled V-8 engine, factory type 41, designed by a Swiss-born engineer Marc Birkigt, the design team chief and the founder of the Hispano-Suiza company. The first prototype was completed in early 1916 and the first flight took place in April at the Villacoublay airfield. The prototype was equipped with a 140 mhp Hispano-Suiza HS 8A engine and due to its heavier weight, it had somewhat lower maneuverability than the Nieuport 17 C1 fighter, but it was stronger and faster. During trials it showed exceptional stability and reached a maximum horizontal speed of 213 km/h and climbing time of 15 minutes to 3,000 m.

On 10 May 1916 the French Air Force ordered the production of 267 fighters, officially designated as Spad S.7 C1. Deliveries commenced on 2 September of the same year and by August of 1917 a total of 495 machines had been delivered. From April a stronger 180 mhp engine was introduced. By the end of 1917, a total of 50 escadrilles used the Spad S.7, at the time when the newer version, S.13, became ready for service. In April 1918, six months before the end of the war, a total of 507 Spad S.7s still remained in service. About 6,000 were built, including 200 license-built in the UK.

During World War I, the Spad S.7 was used successfully in eight Allied air forces, which included France, Russia, USA, Great Britain, Italy, Belgium, Serbia and Greece. After the war, this fighter was used in the air forces of Brazil, Czechoslovakia, Estonia, Finland, Greece, KSHS (from 1929 the KJ), Peru, Poland, Portugal, Romania and Siam. The type remained in French service until 1928 as a standard trainer for pilot license qualification.

## Spad S.13 Development

The second version of Spad fighter, designated as Spad 13 or Spad XIII (military designation S.13 C1), was also known by the French as the Spad-Hispano 220 CH. Engineer Béchéreau developed it from the Spad 7 by installing a more powerful Hispano engine and equipping it with two machine guns. The engine rpm increased





from 1,800 to 2,000, which enabled its power to increase to 220 mhp. Further engine developments incorporating increased compression ratio were designated HS 8Be and became standard in the late war Spad 13s. The new fighter maintained its predecessor's contours, but it required a stronger construction and enlarged dimensions. A trial series of 20 aircraft was under construction in March of 1917 and the first prototype (S392) took off on 4 April 1917. Following successful testing, these aircraft were all introduced into fighter units by the end of May. During 1917 and 1918 the manufacture of the Spad 13 took place at the parent company and under license at eight French factories: ACM, Adolphe Bernard, Blériot, Borel, Kellner, Pierre Levasseur, Nieuport and SAFCA. Until the end of production in 1919, a total of 7,500 Spad 13s was delivered, of which the parent factory produced some 1,143 examples.

From May 1917 until the end of the war, the Spad 13 gradually replaced the older Spad 7 and Nieuport 27 fighters in almost all of 81 fighter *escadrilles*. On 1 October the French had a total of 764 operational examples. The Spad 13 contributed significantly to the balance of air supremacy in Allied favour towards the end of the war. This type was flown by most of the French pilots of the period including most of the aces. Additionally, Spad 13s served with the British, American, Italian, Belgian and Serbian air forces during the war. After the war, France sold its surplus Spad 13s to Belgium, Czechoslovakia, Greece, Japan, KSHS, Poland and Romania. The French Air Force removed the Spad 13 from service in 1923.

*Spad fighters at Pančevo airfield in June 1922 during a celebration with the Army orchestra. The aircraft still carry the French-style vertical flag on the rudder: (top) the first machine in the row is Kelner-built S.13 C1 (Radojan Živanović via Robert Čopeč); (bottom) original French roundels on top of the wings and standard French five tone camouflage can be seen on the S.13 C1 at the right of the photo. (Mario Raguž)*

## Serbian pilots on the Western front

The first Serbian officer who flew with the French on the Western front was *por* Tadija R. Sondermajer. After contracting malaria, he was sent to France to recover. After a partial recovery, he first applied to aerobatic school (*Chace d'acrobatie*) at Pau (*École d'aviation Pau*) and then attended gunnery school at Cazaux (*École militaire de tir aérien de Cazaux*), at which he finished best in class. On 1 March 1918 he joined Spa.3, called by René Fonck, top *Entente* fighter ace. The first machine he flew was S.7 S3088, which in April he substituted for Spad 13 S2669. Sondermajer, the first Serbian Spad 13 pilot, conducted a number of combat flights and managed to shoot down two German aircraft. The first victory on 20 May was not immediately confirmed due to confusion concerning the place of the dogfight, while the second one from 21 May was recognized. The same day, while returning from the second mission of the day, at an altitude of 500 m, the engine of his Spad 13 caught fire. Sondermajer managed to land, however he sustained serious burns which forced him to remain in a French hospital for four months.

Another Serbian pilot, *kap* Branko V. Vukosavljević, following long medical treatment in France, was sent on his own accord to the Western front for training. He remained at the headquarters of *Grouppe de Combat 16* (GC16) and on 14 June 1917 he was assigned to Spa.79 and on 14 June he was returned to GC16, which had three *escadrilles* at its disposal, Spa.112, Spa.150 and Spa.151. Vukosavljević conducted combat flights with Spa.150. In July, he achieved one victory, which remained unconfirmed, and towards the end of August he returned to the Salonika front and took command of 1.SE, which was formed from *Escadrille AR.521*.

The third Serbian pilot on the Western front was *por* Miodrag P. Tomić. He arrived in France on 1 August 1918 and was immediately sent to the Headquarters of GC21. He flew a Spad 13 in multiple

In 1919, a decision was made that, in place of the various national markings, a chevron style marking should be adopted in addition to the Yugoslav flag across the entire rudder.

Between 1920 and 1924 Spads carried chevron markings in four or six standard positions. The tip of the chevron was always positioned in the direction of flight and the front band was Blue. The angle of the sides of each chevron was mostly at 120 degrees. Note a very large chevron on the underside of the lower wings on this machine.

(Mario Raguz)



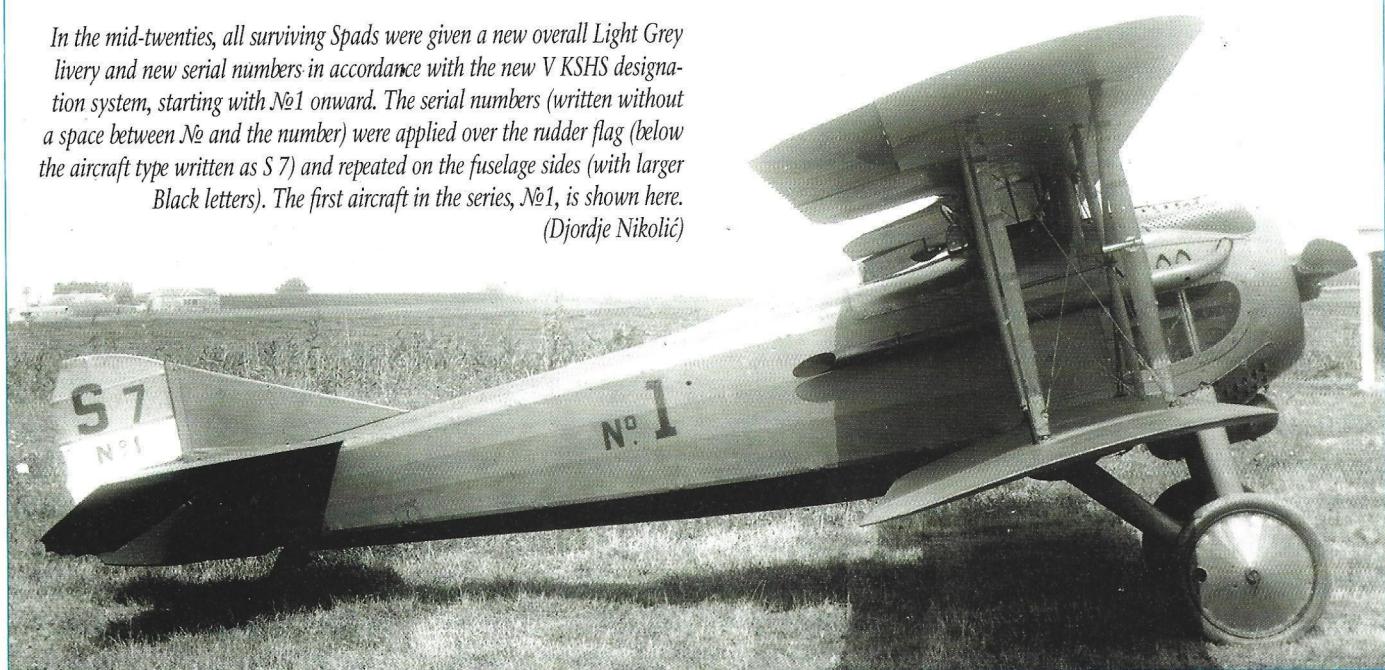
Mechanic soldier Toni Mele in front of an unknown Spad S.13 C1 which suffered a serious accident, with the starboard wing damaged, destroyed propeller and tires.

This photo was taken in 1922 at Novi Sad. (Marko Malec)



In the mid-twenties, all surviving Spads were given a new overall Light Grey livery and new serial numbers in accordance with the new V KSHS designation system, starting with №1 onward. The serial numbers (written without a space between № and the number) were applied over the rudder flag (below the aircraft type written as S 7) and repeated on the fuselage sides (with larger Black letters). The first aircraft in the series, №1, is shown here.

(Djordje Nikolic)





The second aircraft to be marked in accordance with new designation system, Spad S.7 C1 №2. (Aleksandar Kolo)

dogfights. He claimed one aircraft shot down, plus a Drachen Balloon, but the French did not recognize either. At the beginning of September, he returned to the Salonika front and joined *Escadrille Spa.523*.

French *Sous-lieutenant* Petar V. Marinović, of Serbian and Russian descent, was the leading ace within *Spa.94* with 22 confirmed victories (13 alone and nine shared) as well as 10 unconfirmed victories (five alone and five shared). He died on 2 September 1919 when his Spad crashed during an air show at Evere airfield in Brussels.

## Spads in the Balkans

The French units which remained in the Balkans started disbanding at the beginning of summer 1919. In August 1919 *Escadrille BR.508* disbanded and all aircraft were handed over to *Spa.523*. On 2 September an order was issued that the staff of *Spa.523* be reduced to only three men and that the unit be disbanded. The aircraft of the 1<sup>SE</sup> (alias AR.521), 12 Dorand AR 1 A2s, one AR 2 A2s, 12 Breguet 14s, seven Nieuport 24s and 27s and one Spad 7, were handed over free of charge to the Serbian Army's Supreme Command. A total of 48 aircraft, 20 Spads (19 Spad 7s and one Spad 13) and 28 Breguet 14s, were also handed over at Novi Sad. The aircraft delivered from the disbanded French units were evaluated as new or used and only new aircraft were paid for. From the aircraft handed over at Novi Sad, seven Spad 7s and one Spad 13 were accepted into service. From the disbanded *Escadrille Spa.523* from Niš a total of four Spad 7s were accepted. The remaining eight Spad 7s were delivered from the French equipment depot at Thessaloniki in Greece.

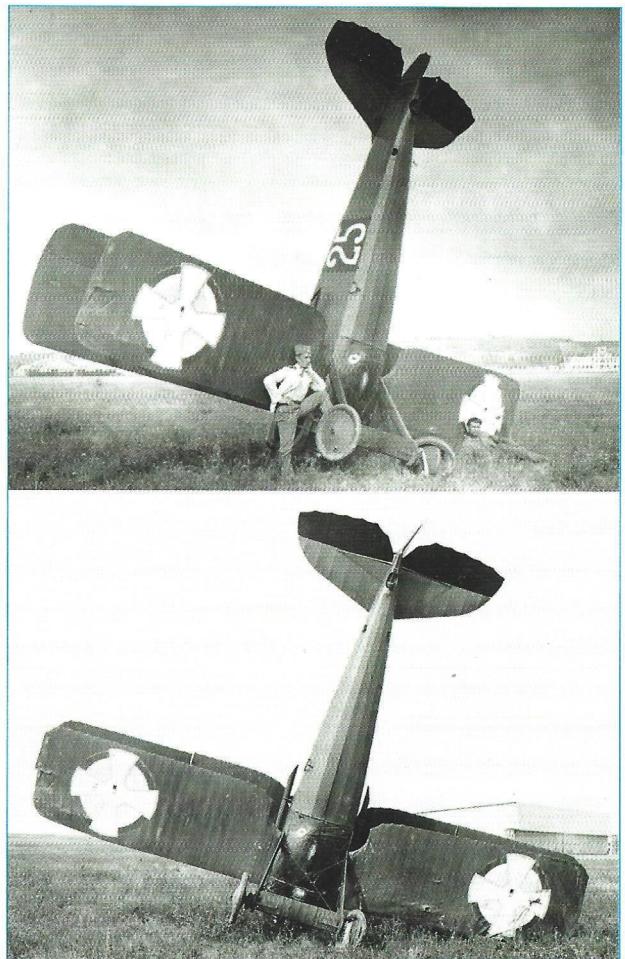
The Serbian Air Force knew of the Spad 13's deficiencies and at first declined in January 1920 an offer to buy the type. Finally, on 2 January 1920 the Minister of War and Marine informed the Supreme Command that the purchase of four Spad 13s was approved, as there were no better alternative fighter aircraft available at the time. In the spring of 1921, V KSHS accepted the second batch of French aircraft, which included eight Spad 7s, four Spad 13s and 25 Breguet 14s. The Spad fighters belonged to *Escadrille Spa.507*.

The first accident with a Spad took place on 16 May 1921 at Novi Sad airfield. Flying low in a Spad 7, *por* engineer Dušan M. Radović collided with soldier Vladimir Miljaković who died several hours later from head injuries.

On 11 November 1923 in Novi Sad, LE of 1<sup>st</sup> Air Command along with a pilot school was created. On 18 October 1923 *kap ik* Miodrag P. Tomić was assigned as the first *Escadrille* commander. In 1924 *Escadrille* was changed to 5<sup>th</sup> Fighter *Escadrille* (5<sup>th</sup> LE) belonging to the 1<sup>st</sup> Air Reconnaissance Group of 1<sup>st</sup> Air Command. During March 1925 the *Escadrille* joined the newly formed 1. *ваздухопловни ћук* (1.VP – 1<sup>st</sup> Aviation Regiment). A number of Spads were used until 1924 in fighter detachments belonging to reconnaissance (Army) *escadrilles*.

The Pilot School, apart from Spads, used training types such as the Brandenburg B.I and Hanriot H.320 primary trainers, and

Two shots of an accident when S.7 C1 №9 "White 25" from Fighter Pilot School was set on its nose by *por* *Jovan Rapajić* on 26 June 1932 at Zemun airfield: (top) White code 25 on Black square on the fuselage side clearly signals the training role of this machine (Ognjan Petrović); (bottom) underside shows overall Dark Green scheme of this aircraft (Čedomir Janić)





*A completely destroyed Spad S.7 C1 №4 which crashed on 3 February 1929 at Zemun airfield. (Kotnik family via Čedomir Janić)*

Brandenburg CI and Rogožarski Fizir F1V conversion trainers. From 1926 onwards, the new 400 mhp Lorraine-Dietrich-powered Breguet 19 "combat two-seaters" were also introduced for training.

Following a mid-air catastrophe in 1924 when one Spad 13 suffered an engine fire, all Spad 13 fighters were grounded. A similar situation took place with the French, Spad 13s were removed from service very early (additionally due to unreliable engines), while the Spad 7s remained in service almost until the end of the 1930s.

After the retirement of Spad 13s from service within V KSHS, the remaining aircraft of the type were overhauled and modified to the older and less powerful, but more reliable, 180 mhp Hispano-Suiza engine which was identical to that of the Spad 7. This prolonged their service life. The new version was introduced in 1925 and was designated as the Spad 180 KS. The same designation was already used on original Spad 7s.

The new Dewoitine D.1 C1 aircraft were introduced in 1926 and slowly replaced Spads in fighter roles. The Spad 180 KS aircraft remained in service as unarmed fighter trainers along with the new Gourdou-Leseurre fighter trainers.

At the end of 1929, Zmaj conducted the installation of license-built Merville propellers on the Spad 7. The same factory also installed 10 sets of tail skids. Additional fuel tanks were also installed domestically to increase the range. In mid-December 1928, a total of 10 Spads remained in reserve. All of the measures, modifications, service use, renaming and painting clearly show that V KSHS unified all Spads as standard fighter trainers with the intent to use them for a long period of time.

At least one Spad 180 KS (№23) was modified to a so-called "pylep" (French: *rouler*, i.e. taxiing plane) by removing the lower pair of wings and installing a pair of long struts. This practice was common at the time in other air forces as well. By using the "roulers" pilots were able to learn about the aircraft and ensure safe taxiing on the ground, which helped avoid mishaps.

During Spad's service with V KSHS a total of three pilots died. The first was *por* Franc J. Stenovec whose Spad 13 caught fire in flight on 18 April 1924 at Novi Sad. A little over a month and a half later on 31 May, also at Novi Sad, *vod IIik* Ljudevit A. Polak died when his Spad 7 engine suddenly exploded at an altitude of 150 m. The third and the last casualty was *nar* Lazar J. Marković whose Spad 7 (№5) crashed on 19 October 1929 at Banat while on a low level flight over the Danube.

By using the Spad 180 KS in a training role only, as well as with the support of a sufficient number of spare aircraft in stock, it was possible for this type to remain in service with V KSHS until the early thirties. Understandably, the number of operational aircraft gradually decreased, some were scrapped due to the service life expiration and some experienced accidents. Apart from the three fatal accidents, many minor accidents also took place with aircraft sustaining various degrees of damage.

The last service years were spent training reserve fighter pilot officers at the Pilot School of the 6.LP at Zemun airfield. The last traces of Spad service were found in the photographs of two crashes, which took place during the summer of 1932. One Spad was displayed at the first air expo in Belgrade during October 1925. One refurbished Spad 180 KS, painted in overall Dark Green with no markings but with the French flag on the rudder, was displayed at the First International Air Expo in Belgrade between 28 May and 13 June 1938. This aircraft was later intended for display at the aeronautical section of the Belgrade's *Војни музеј* (Military Museum). KJ was not able to make this idea come to fruition and this Spad and many other aircraft were lost during the 1941 April War. The only remaining trace of a Spad in the former Yugoslavia is a 180 mhp Hispano-Suiza engine, which is preserved today at the Belgrade's *Музеј ваздухопловства* (Aviation Museum).

# Camouflage and Markings

## Type designations

Factory model designations were SPAD VII and SPAD XIII as well as SPAD 7 and SPAD 13. The French Air Force designated these fighters as Spad S.7 C1 and Spad S.13 C1 (letter C stands for *chasseur* – fighter). V KSHS usually used shortened French designations S 7 and S 13, but it also often used the aircraft designation system in accordance with the engine power – Spad 7 was Spad 180 KS and Spad 13 was Spad 220 KS. Even modified Spad 13s with the 180 mhp engine carried the same designation, Spad 180 KS.

## Serial numbers

During the first six post war years, both Spad types within V KSHS carried the original French serial numbers (*Numéros SFA*), which consisted of the letter S and four or five-digit number. The serial numbers were written in Black across the upper half of the French tricolour on the rudder, starting with a large letter S (usually underlined with a horizontal line), of unusually large dimensions about a third as tall as the rudder. The number height was about quarter that of the letter S. The original serial numbers from the time of V KSHS are not entirely known. According to the available information, from a total of 32 Spad fighters used in the KJ, only seven original S numbers for Spad 7 (S1343, S1584, S3342, S3344, S3691, S7203, S7190) and only two for Spad 13 (S16705 and S16711) are known.

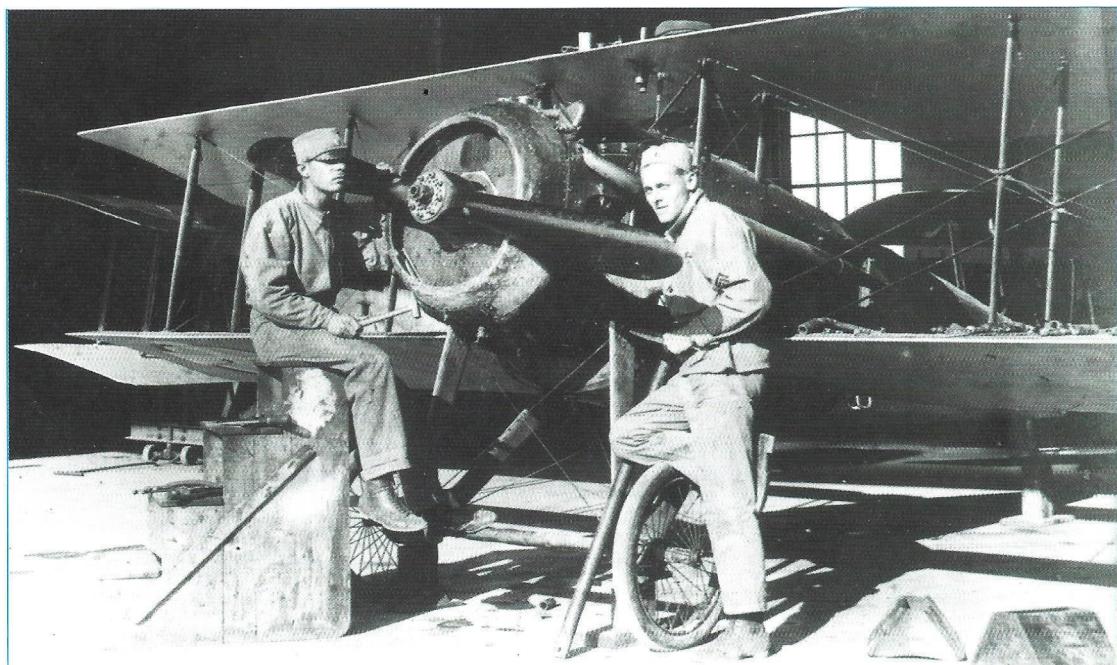
In the mid-twenties, all surviving Spads were given new serial numbers in accordance with the new VV designation system starting with №1 onward. That system was introduced with the arrival of Dewoitine D.1 fighters. The serial numbers (written without a space between № and the number) were applied over the rudder flag (below the aircraft type written as S 7) and repeated on the fuselage sides (with larger Black letters).

## Markings

V KSHS aircraft in the period between 1918 and 1924 carried multiple iterations of the national markings. Both Spad types were introduced with the original French markings, although some machines carried new Serbian roundels (White/Blue/Red with a White outer ring) which were planned to become standard Serbian insignia shortly before breakthrough at the Salonika front.

In 1919, a decision was made that in place of the various national markings a new arrow (chevron) style marking would be adopted in addition to the Yugoslav flag across the entire rudder. Between 1920 and 1924 Spads carried chevron markings in four or six standard positions. The tip of the chevron was always positioned in the direction of flight and the front band was Blue in colour. The angle of the sides of each chevron was 120 degrees.

In the middle of 1924, new standardized national insignia were introduced on all V KSHS aircraft. The new marking, a cockade with three rings (from outside inwards Red/White/Blue), had a White „*косовски крст*” (“Kosovo cross”) applied in the centre which was outlined in a Dark Blue. The diameter of the “Kosovo cross” on Spads was smaller than the diameter of the previously worn French *cockades*.



Spad S.7 C1 undergoing engine maintenance in a hangar, most likely at Novi Sad. (Dejan Milojević)



An unknown Spad S.7 C1 at Novi Sad airfield, in the mid twenties. The machine, with Dark Green overall livery, was freshly overhauled. Note the absence of rudder inscriptions. Large standardized "Kosovo Cross" insignia are visible below the wings. Note the White ring around the front of the engine cowling, immediately behind the propeller. (Janko Dobnikar family via Predrag Miladinović)

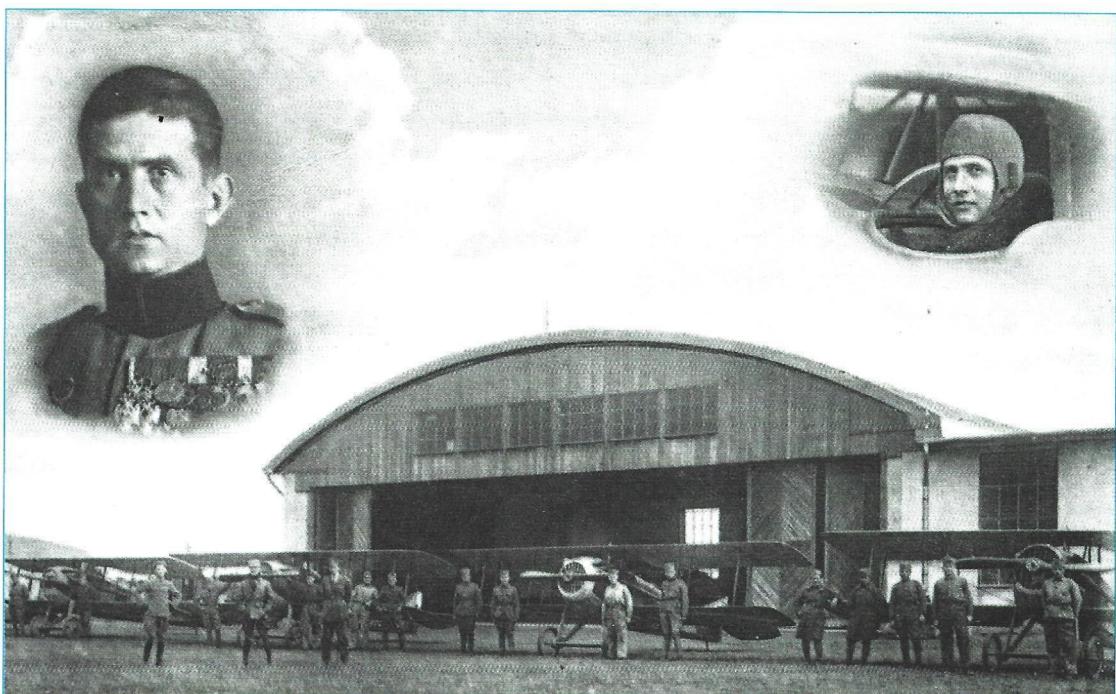
A group of Yugoslav active and reserve fighter pilots from 6<sup>th</sup> Fighter Regiment

Pilot School in front of a Spad S.7 C1 at Zemun airfield in the very late 1920s.

On the far right is Vasilije Stojanović, who would later become the chief test pilot at the Ikarus factory. The third from right standing is Radoslav Djordjević (CO of 4.LP in April War), the fourth Janko Markićević, the fifth Teodor Uzelac, the sixth Miodrag Tomić and the tenth Siniša Nikolić. (Djordje Nikolić)



Popular postcard with aviation motif: four Spads of 1<sup>st</sup> Fighter Escadrille at Novi Sad and two images of kap Miodrag Tomić, the unit's CO from 18 October 1923 until 1 November 1924. The second machine from the left is an S.13, the other three are S.7s. (Postcard via Djordje Nikolić)



and measured 114 cm (45 in). As standard, the national flag (Blue/White/Red, top to bottom) was applied over the entire rudder.

#### Camouflage schemes

The first Spads in service had varnished fabric surfaces and metal surfaces painted in a Light Yellow colour (*Jaune Claire*). Generally, Spads and other French aircraft in the period of 1916 to 1917 and at the beginning of 1918, had a thick coat of varnish mixed with Yellow pigment and Aluminum powder. Metal surfaces appeared darker in colour. From October 1917 the French began introducing camouflage on upper surfaces, which consisted of irregular patches of Brown (*Marron*), Dark Green (*Vert Fonce*), Light Green (*Vert Clair*), Beige (*Beige*) and Black (*Noir*). The undersides remained in Light Yellow (*Jaune Claire*). The camouflage was standardized at each factory, however each manufacturer adopted the camouflage scheme according to their own scheme, which made it possible to recognize the place of manufacture solely based on the camouflage pattern.

At the beginning of the 1920s V KSHS introduced its first standard camouflage scheme. The scheme was first used on repaired aircraft, which came from captured stocks. These aircraft had overall an Aluminum-Silver colour applied, similar to the Nieuport fighters.

Following the introduction of the “Kosovo cross”, a new practice for the application of the Dark Green was applied. The first aircraft painted in accordance with the new practice were repaired Spads (around 1925) and the first newly introduced aircraft with this scheme were Breguet 19A2s in 1926. The single-colour scheme was retained until 1938, when two-tone camouflage was introduced – although this was never applied of Spads, as none were left in service at the time.

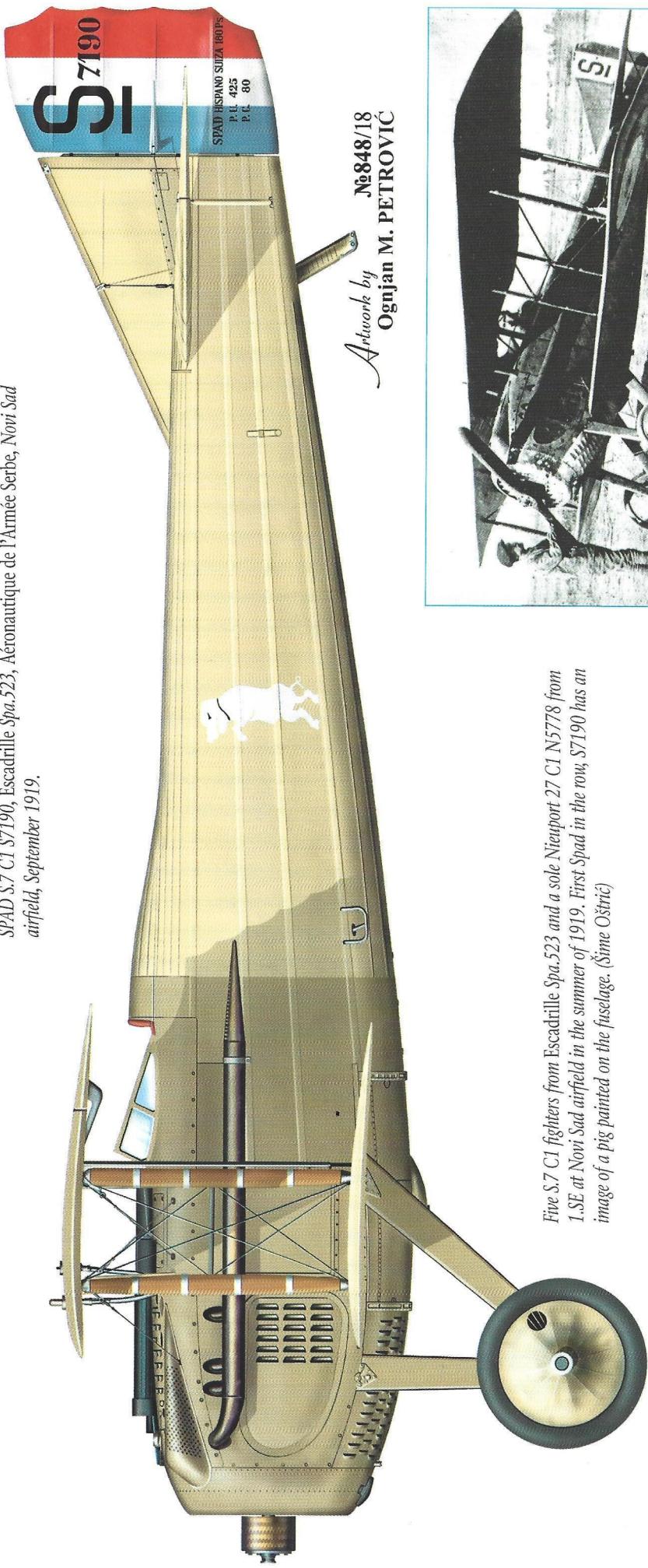
#### Aircraft Characteristics Spad S.7 C1 (V KSHS Spad 180 KS)

Quantity used:	27
Crew:	1
Years of Service:	1919-1932
Span:	7.8 m (25.7 ft)
Length:	6.1 m (19.9 ft)
Height:	2.2 m (7.2 ft)
Wing area:	17.9 m <sup>2</sup> (192 ft <sup>2</sup> )
Engine:	One 180 mhp Hispano-Suiza 8Ab
Empty weight:	500 kg (1,102 lb)
Loaded weight:	705 kg (1,554 lb)
Maximum speed:	212 km/h (132 mph) at 2,000 m (6,561 ft)
Service ceiling:	6,550 m (21,489 ft)
Climb to 3,000 m:	8 min 10 s
Armament:	One synchronized 7.69 mm Vickers M.1909 machine gun Two 10 kg Anilite bombs

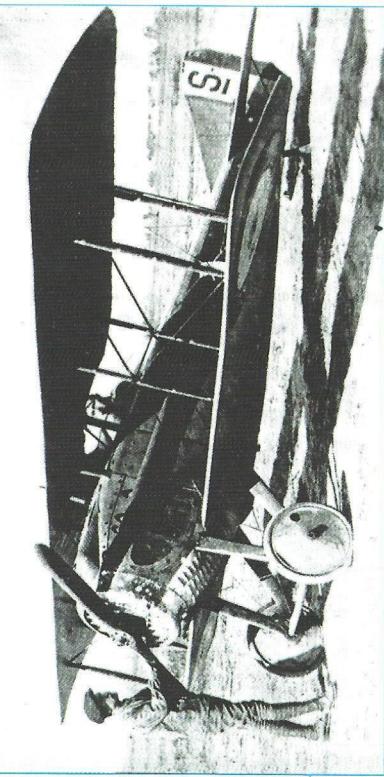
#### Aircraft Characteristics Spad S.13 C1 (V KSHS Spad 220 KS)

Quantity used:	5
Crew:	1
Years of Service:	1921-1924
Span:	8.3 m (27.1 ft)
Length:	6.3 m (20.5 ft)
Height:	2.3 m (7.6 ft)
Wing area:	21.1 m <sup>2</sup> (227 ft <sup>2</sup> )
Engine:	One 220 mhp Hispano-Suiza 8Be
Empty weight:	602 kg (1,326 lb)
Loaded weight:	857 kg (1,888 lb)
Maximum speed:	216 km/h (134 mph) at 2,000 m (6,561 ft)
Service ceiling:	6,580 m (21,587 ft)
Climb to 3,000 m:	8 min 3 s
Armament:	Two synchronized 7.69 mm Vickers M.1909 machine guns

SPAD S.7 C1 S7190, Escadrille Spa.523, Aéronautique de l'Armée Serbe, Novi Sad airfield, September 1919.



Artwork by  
№848/18  
Ognjan M. PETROVIĆ

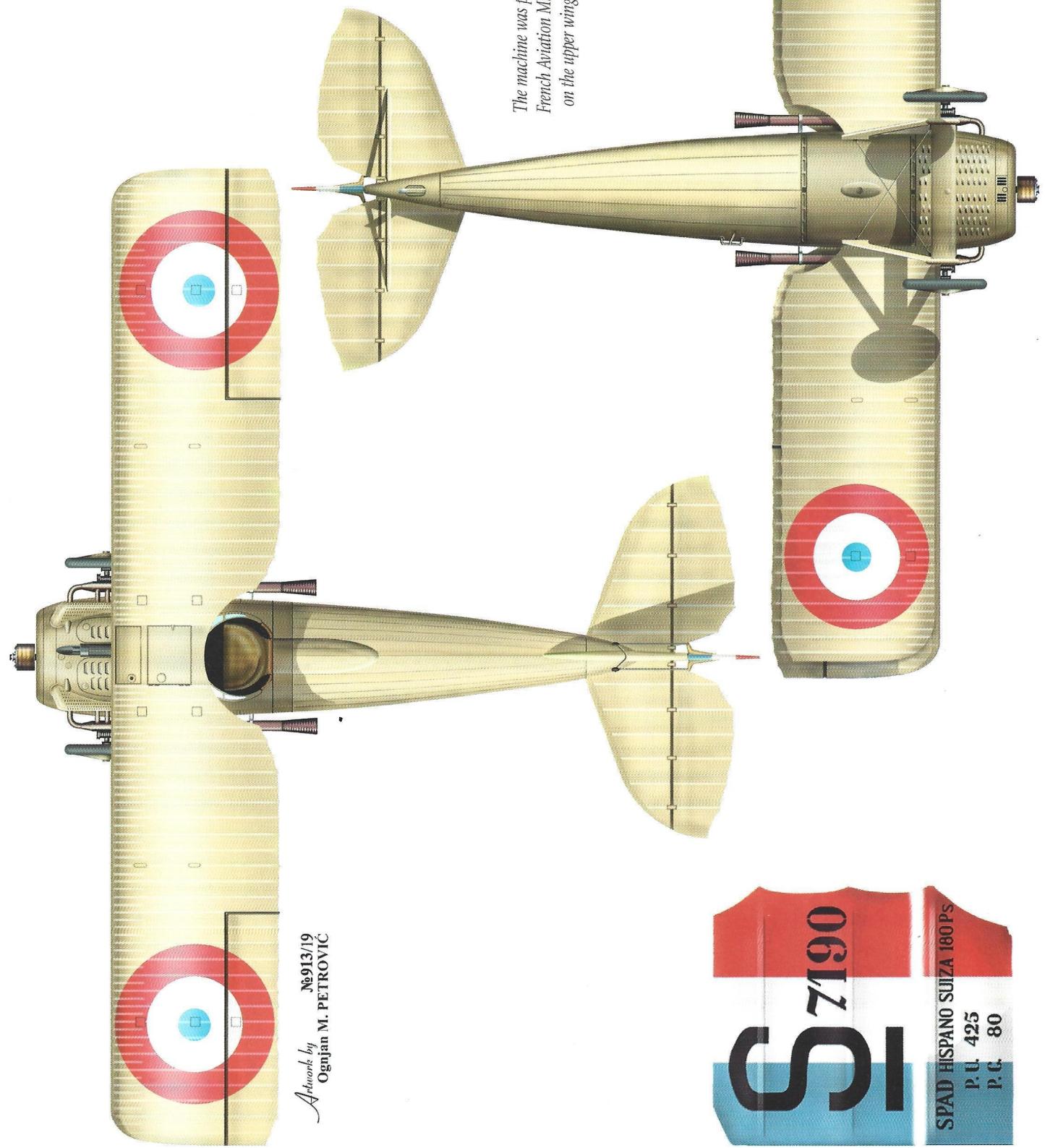


Five S.7 C1 fighters from Escadrille Spa.523 and a sole Nieuport 27 C1 N5778 from 1.SE at Novi Sad airfield in the summer of 1919. First Spad in the row, Sime Ošrić image of a pig painted on the fuselage. (Aleksa Marinović family via Predrag Miladinović)



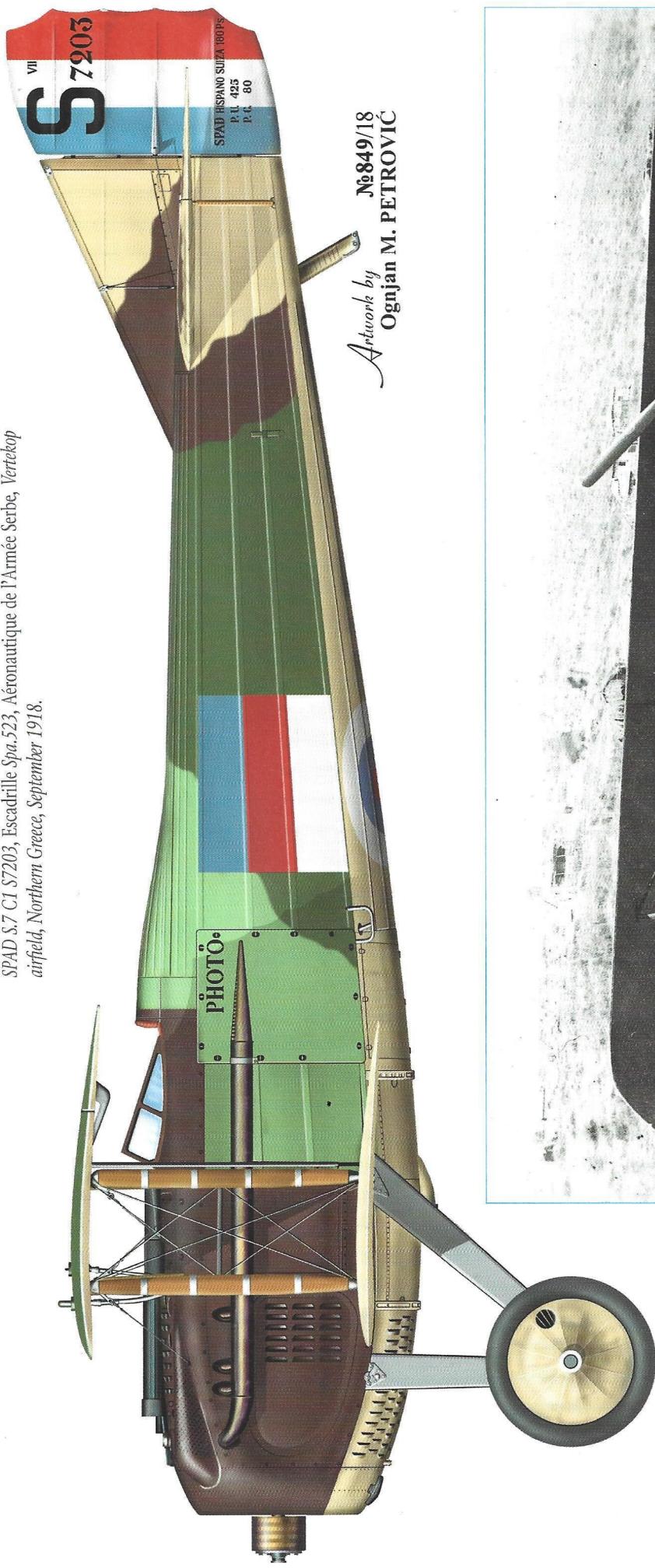
The same fighter just before the engine start. (Aleksa Marinović family via Predrag Miladinović)

*The machine was painted Light Yellow overall. Standard roundels of French Aviation Militaire applied in four positions, 130 cm diameter on the upper wing upper sides and 120 cm on the lower wing under sides.*



**S7190**  
SPAD HISPANO SUIZA 180PS  
P.U. 425  
P.G. 80

SPAD S.7 C1 S7203, Escadrille Spa.523, Aéronautique de l'Armée Serbe, Vertekop airfield, Northern Greece, September 1918.



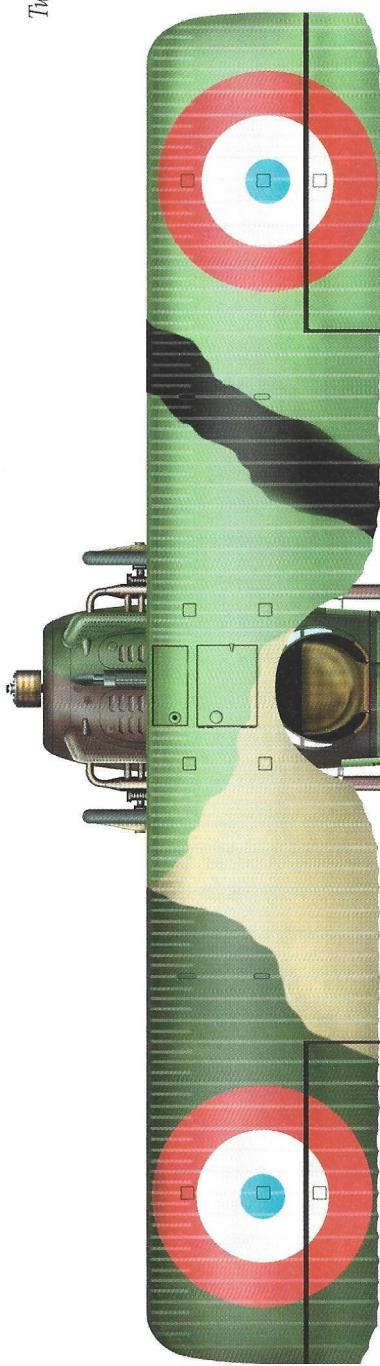
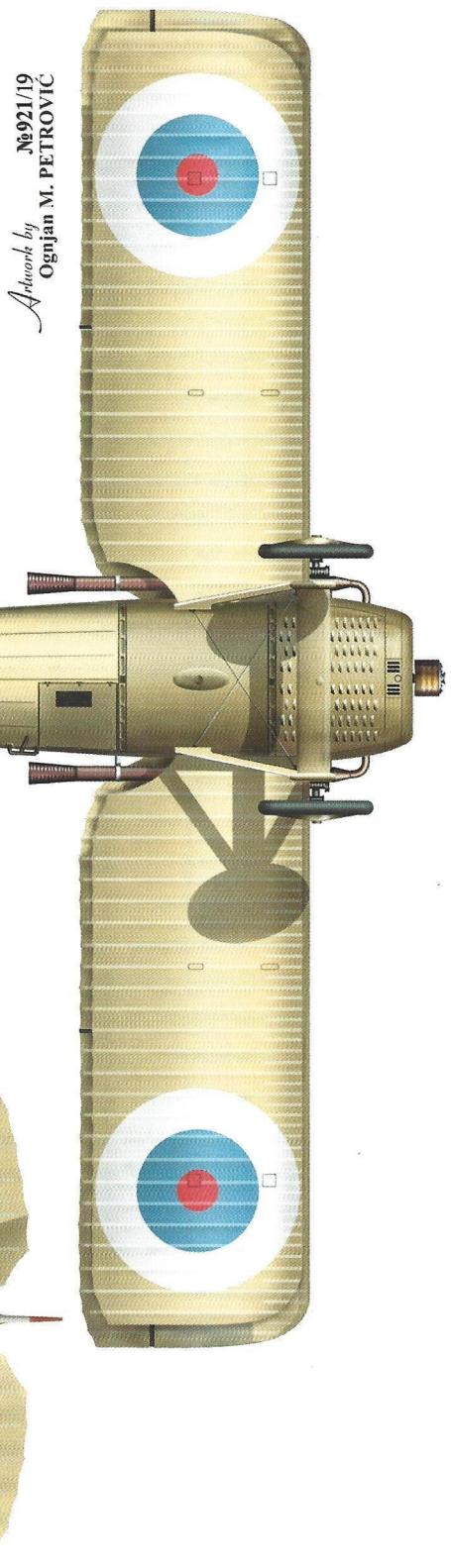
*Artwork by  
Ognjan M. PETROVIC*



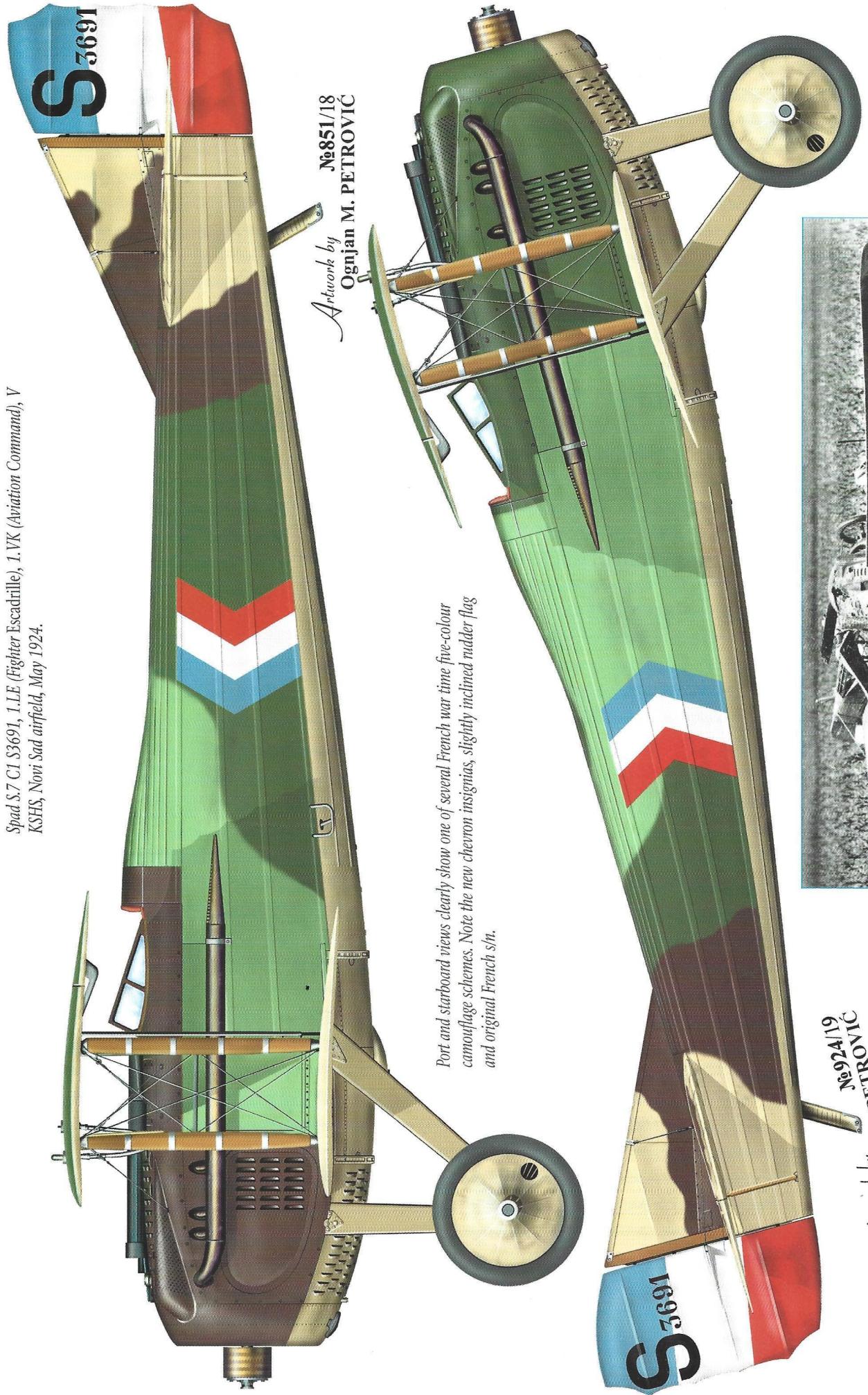
Mechanic Borivoje Teoflović in front of Spad S.7 C1 S7203 belonging to Spa.523 at Vertekop in mid-September 1918. A Serbian tri-colour flag on the fuselage, Serbian roundels on the undersides of lower wings and below the fuselage can be clearly seen on this machine. Note that the original French tricolor and standard titles remained unchanged on the rudder. Note word PHOTO at the fuselage side. (Collection Jean-Claude Sournille via Christophe Cony and Boris Ciglic)

Two plan views of Spad S7 C1 S7203, reconnaissance machine equipped with camera in the fuselage port side, slightly behind the cockpit.

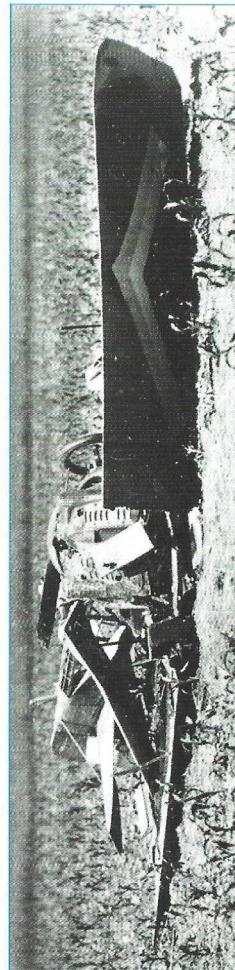
The French five-colour camouflage scheme was applied on the upper surfaces, while the under side was painted in Light Yellow. The machine has mixed Serbian-French national insignias, according to the changes introduced in July-August 1918. New Serbian cockades were painted over original French cockades on the under sides of lower wings, while the fifth insignia was added on the fuselage under side. Original Aviation Militaire roundels remained on the upper sides of upper wings.



Spad S.7 C1 S3691, 1.LE (Fighter Escadrille), 1.VK (Aviation Command), V  
KSHS, Novi Sad airfield, May 1924.



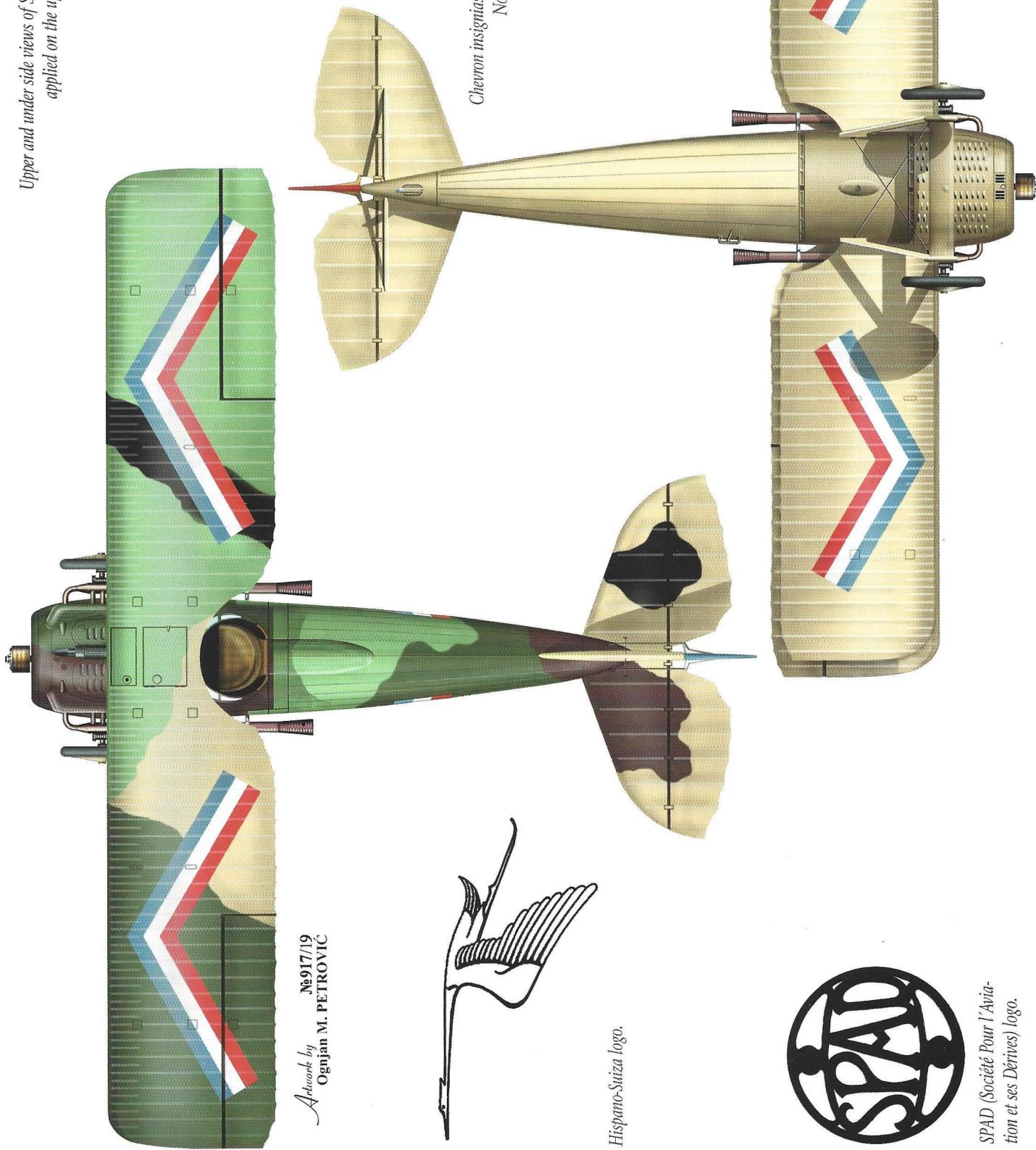
Port and starboard views clearly show one of several French war time five-colour camouflage schemes. Note the new chevron insignias, slightly inclined nudder flag and original French sn.



Artwork by Ognjan M. PETROVIĆ  
№924/19

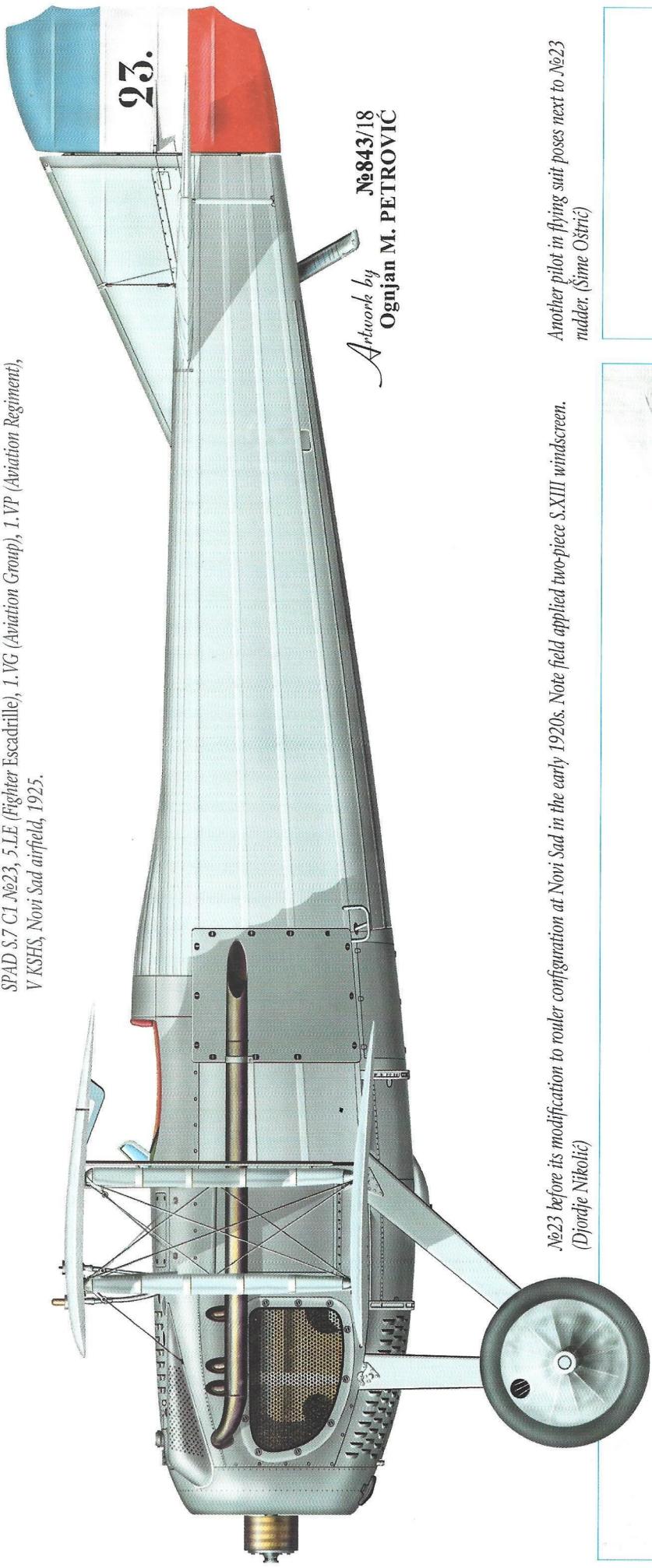
Remarks of a totally destroyed S3691 in which av IIIk Ludvig Polak lost his life on 31 May 1924 at Novi Sad. (Boris Ciglić)

Upper and under side views of Spad S.7 S3691. Five-colour camouflage scheme is applied on the upper sides, Light Yellow colour on the under sides.



SPAD (Société Pour l'Aviation et ses Dérives) logo.

SPAD S.7 C1 №23, 5 LE (Fighter Escadrille), 1. VG (Aviation Group), 1. VP (Aviation Regiment),  
VKSHS, Novi Sad airfield, 1925.



Artwork by  
№843/18  
Ognjan M. PETROVIĆ

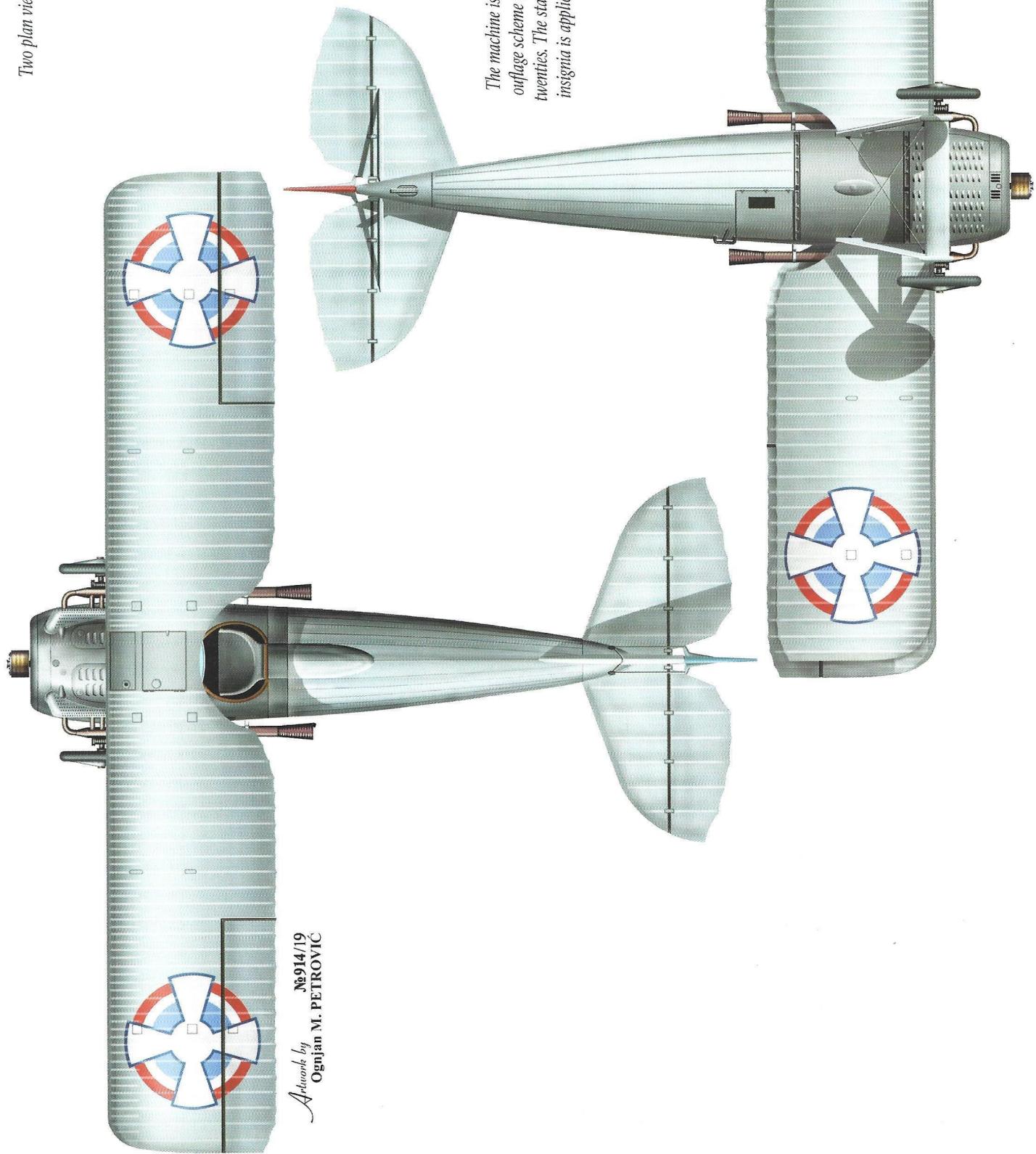
№23 before its modification to router configuration at Novi Sad in the early 1920s. Note field applied two-piece S.XIII windscreen.  
(Đorđe Nikolić)



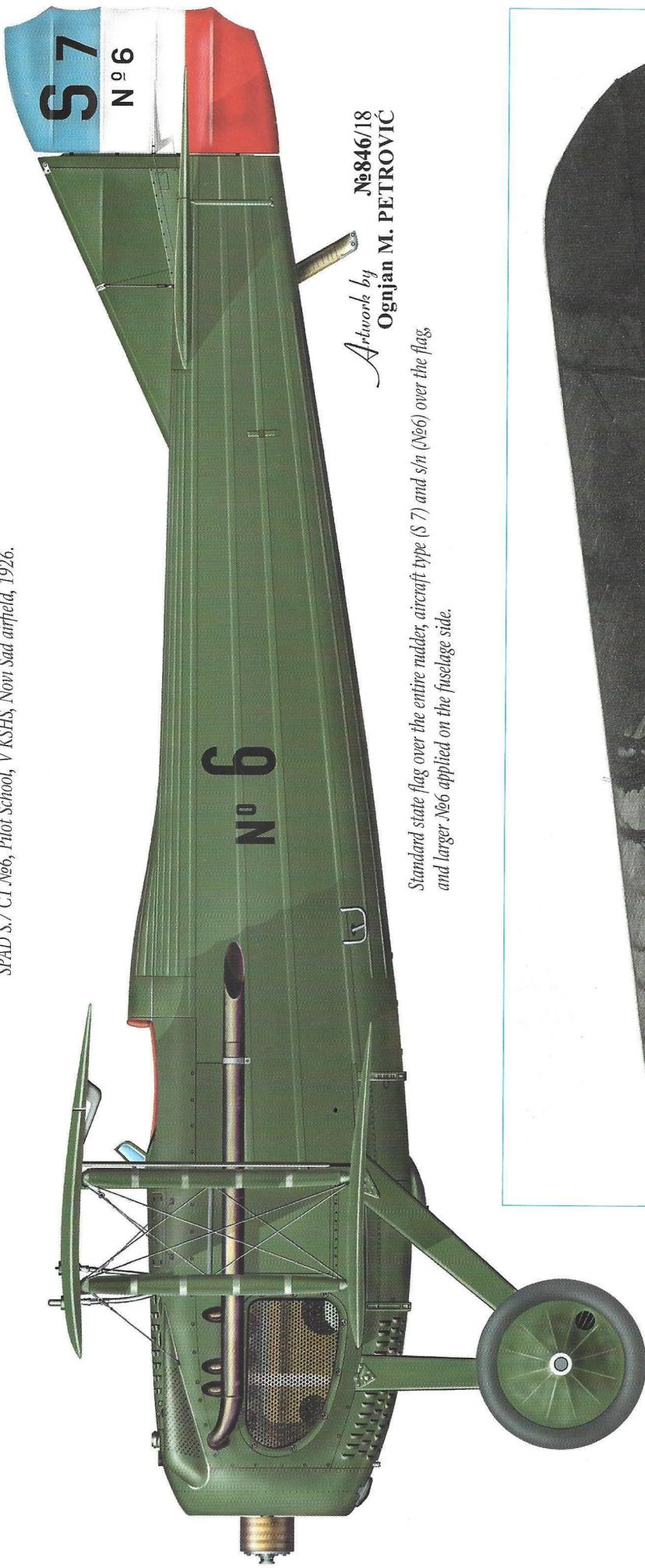
Another pilot in flying suit poses next to №23  
rudder. (Sime Oštrić)

Two plan views of Spad S.7 C1 №23 which originally carried photographic camera.

The machine is painted in newly introduced Nieuport style camouflage scheme (overall Light Grey), which appeared in very early twenties. The standard 110 cm diameter "Kosovo Cross" national insignia is applied in four standard wing positions. Early style ch (23.) is applied on White field on the nudder.

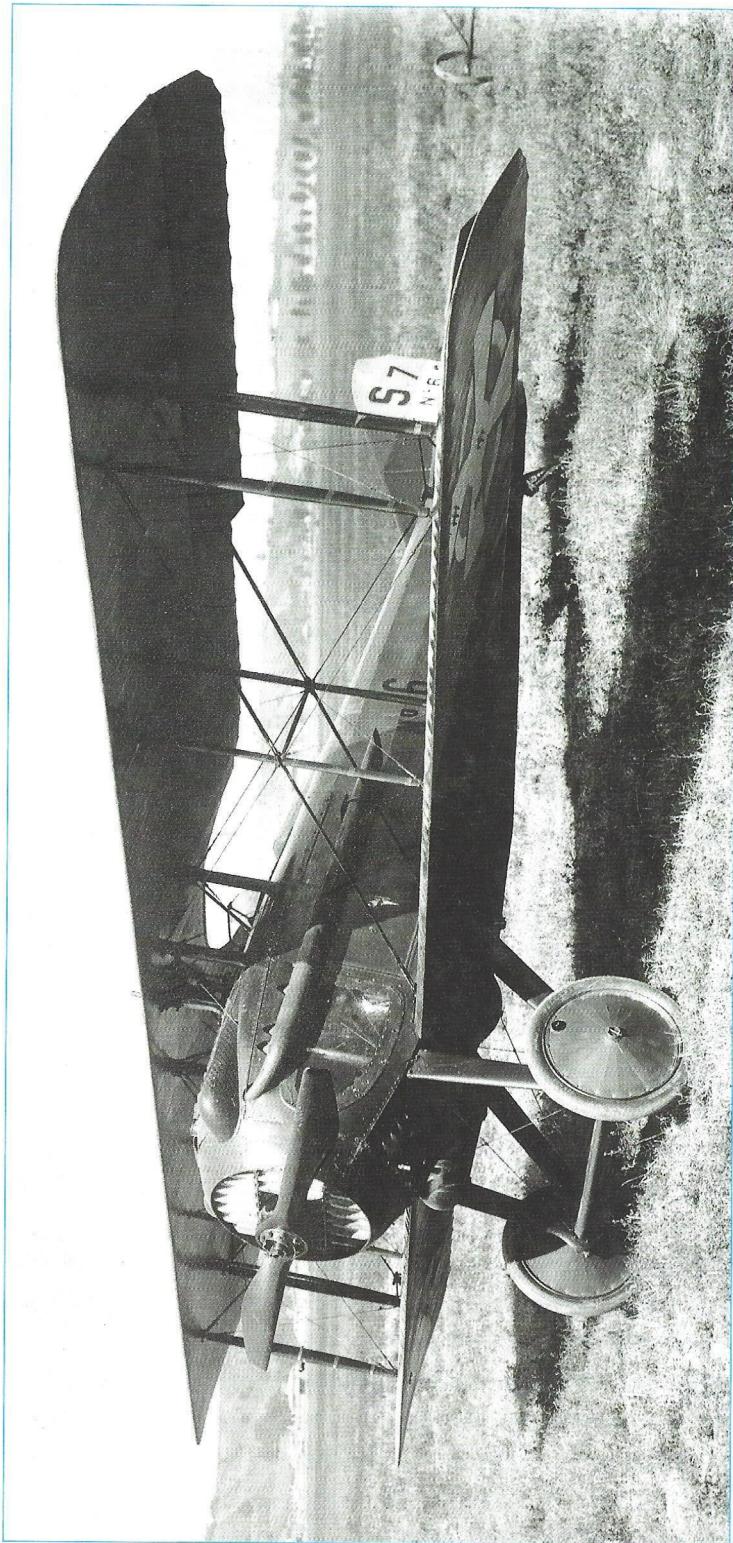


SPAD S.7 C1 №6, Pilot School, V KSHS, Novi Sad airfield, 1926.



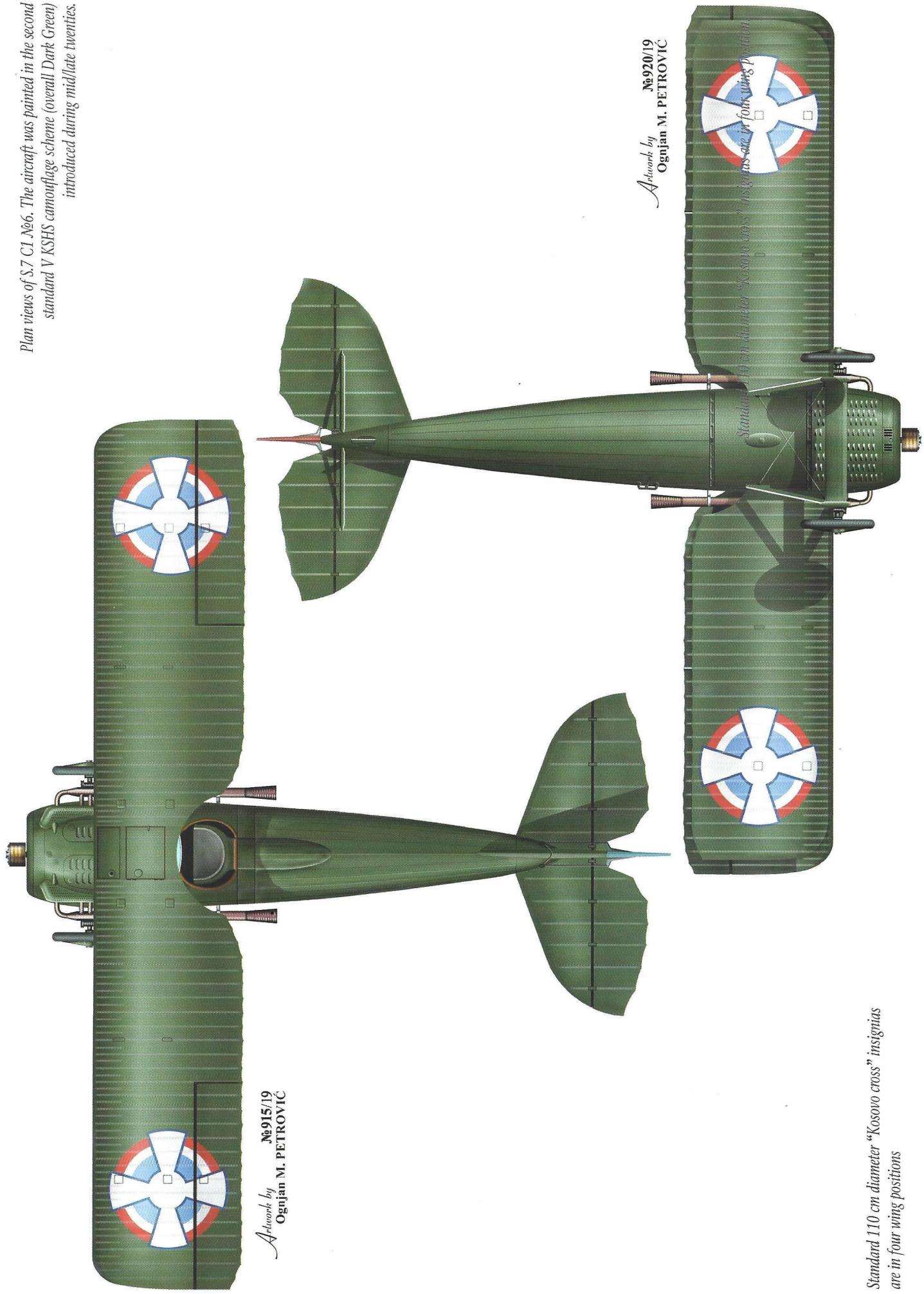
*Artwork by  
№846/18  
Ognjan M. PETROVIĆ*

Standard state flag over the entire nacelle, aircraft type (S 7) and s/n (№6) over the flag,  
and larger №6 applied on the fuselage side.



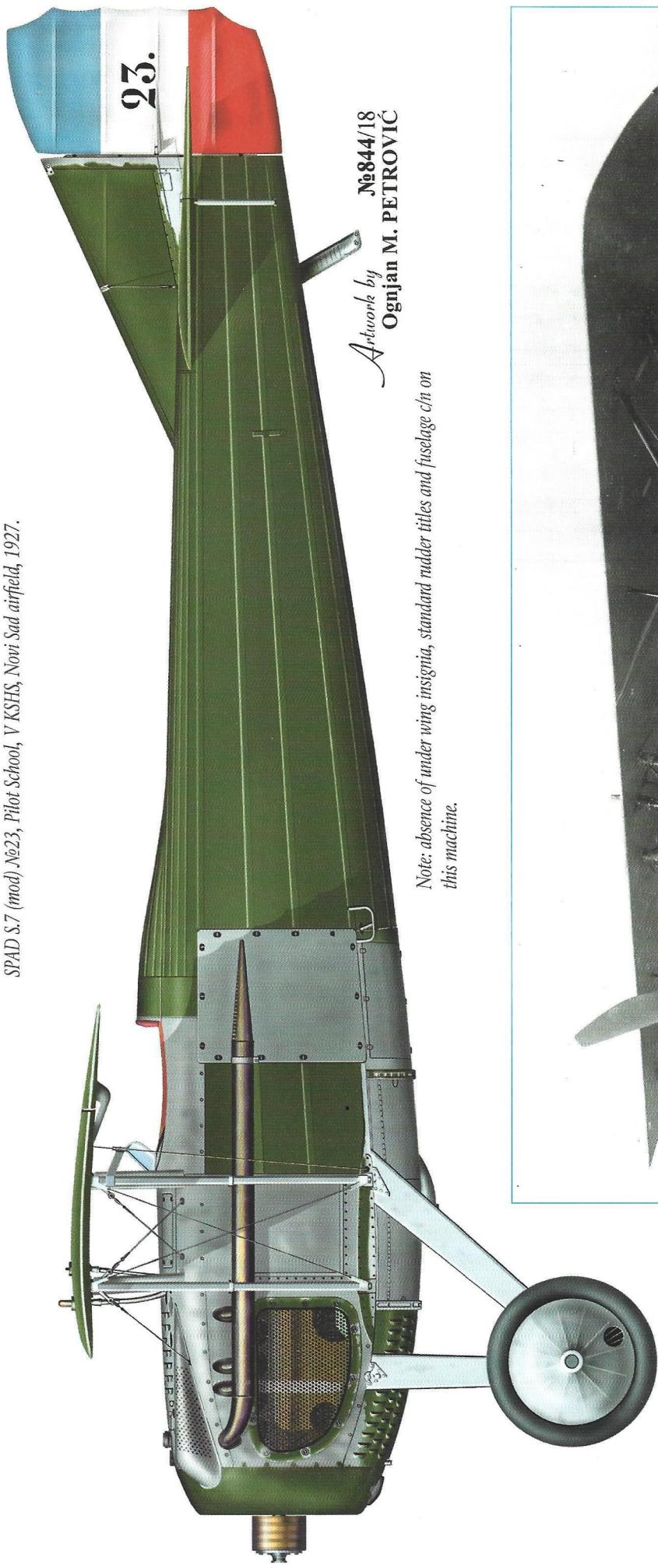
Fine shot of overall Dark Green camouflaged De  
Margay-built Spad S.7 C1 №6 at Zenun airfield,  
19 March 1929. Note mesh covered engine panel  
(Aviation Museum – Belgrade via Predrag Miladi-  
nović)

Plan views of S.7 C1 №6. The aircraft was painted in the second standard V KSHS camouflage scheme (overall Dark Green) introduced during mid/late twenties.



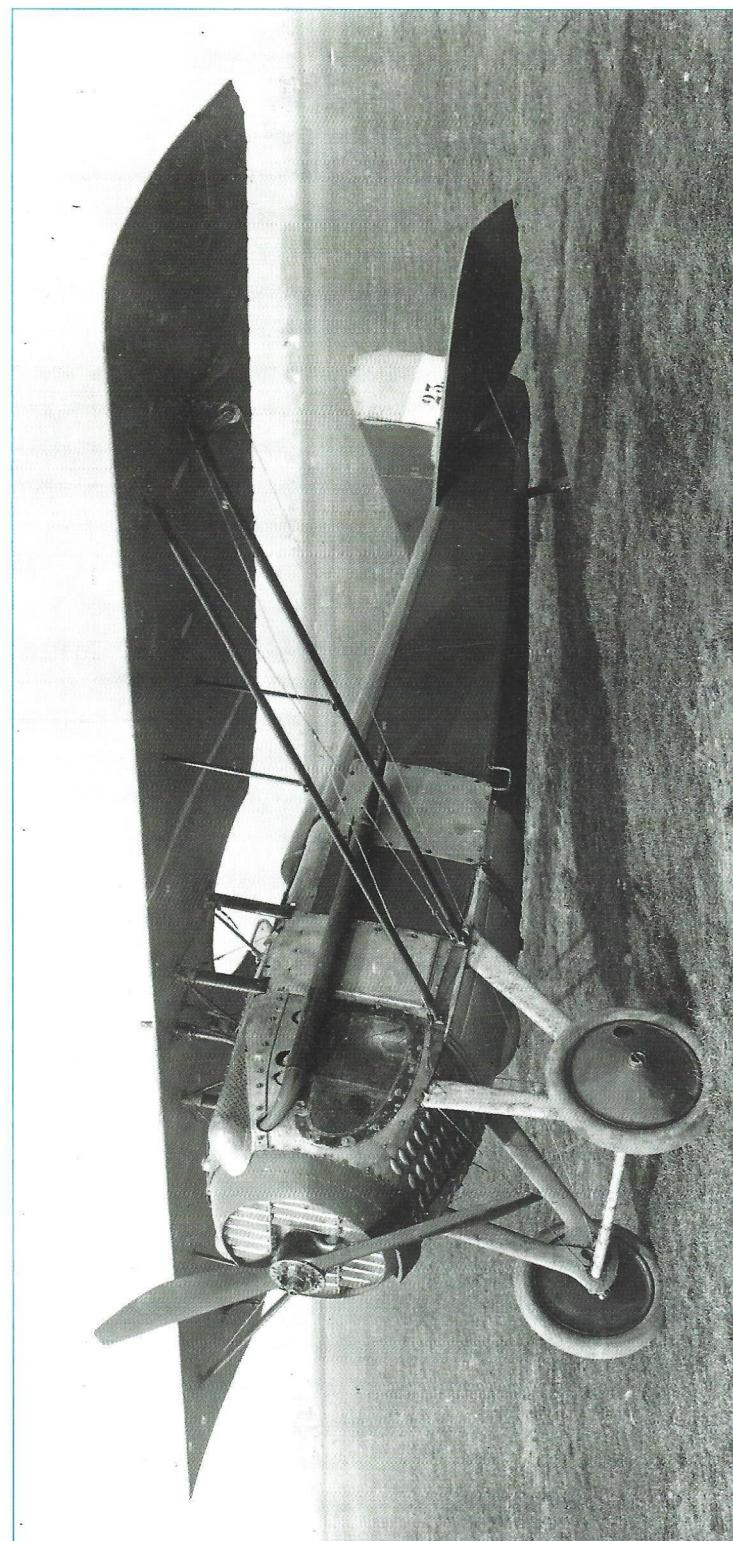
Standard 110 cm diameter "Kosovo cross" insignias are in four wing positions

SPAD S.7 (mod) №23, Pilot School, V KSHS, Novi Sad airfield, 1927.



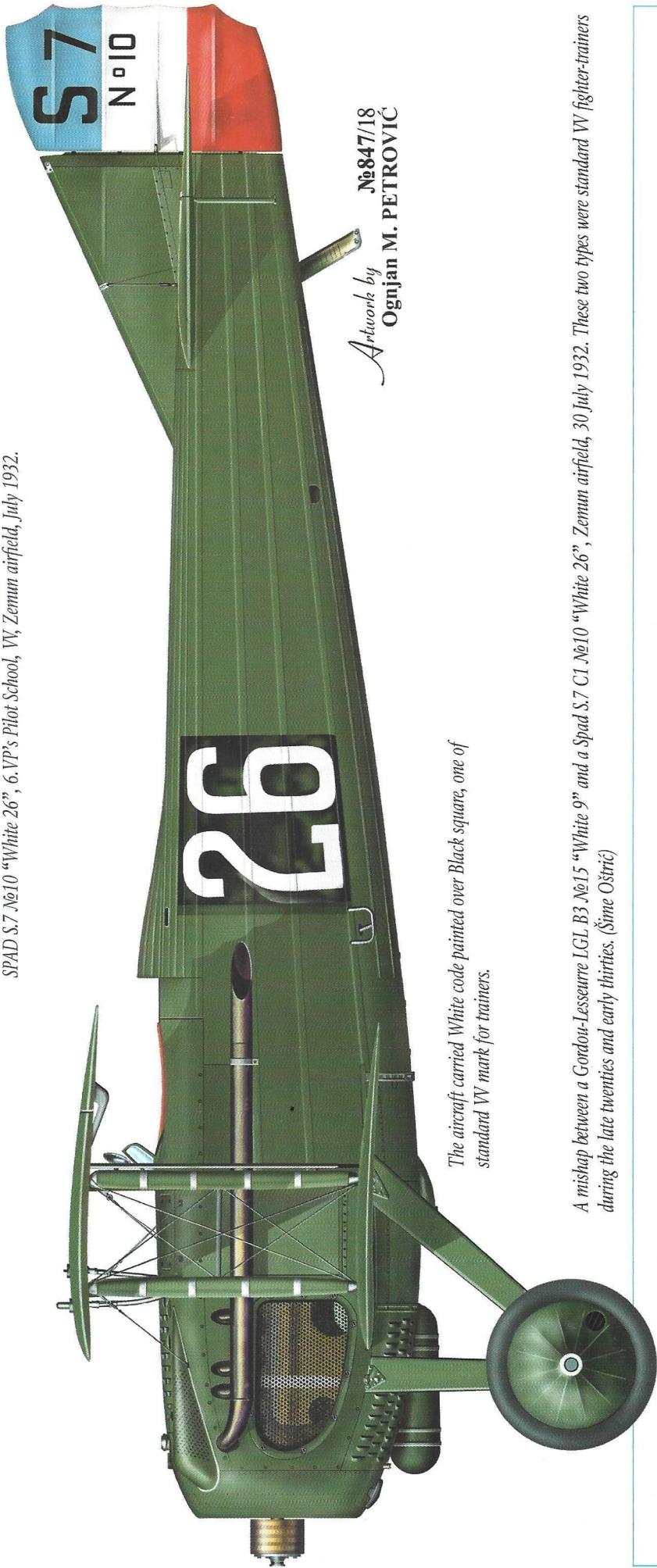
*Artwork by*  
№844/18  
Ognjan M. PETROVIC

*Note: absence of under wing insignia, standard rudder titles and fuselage c/n on this machine.*



*At least one Spad-180 KS (№23) was locally modified in the so called "pyrep" (French: rouler ie taxiing plane) by removing the lower pair of wings and installing a pair of long struts which enabled pilots to learn how to taxi the aircraft safely on the ground, which helped avoid mishaps. The shot was taken in 1927 at "Jugovićev" Novi Sad airfield.*  
(*Šime Oštrić*)

SPAD S.7 №10 "White 26", 6.VP's Pilot School, VV, Zemun airfield, July 1932.



*The aircraft carried White code painted over Black square, one of standard VV mark for trainers.*

*A mishap between a Gondou-Lesseure LGL B3 №15 "White 9" and a Spad S.7 C1 №10 "White 26", Zemun airfield, 30 July 1932. These two types were standard VV fighter-trainers during the late twenties and early thirties. (Šime Oštrić)*



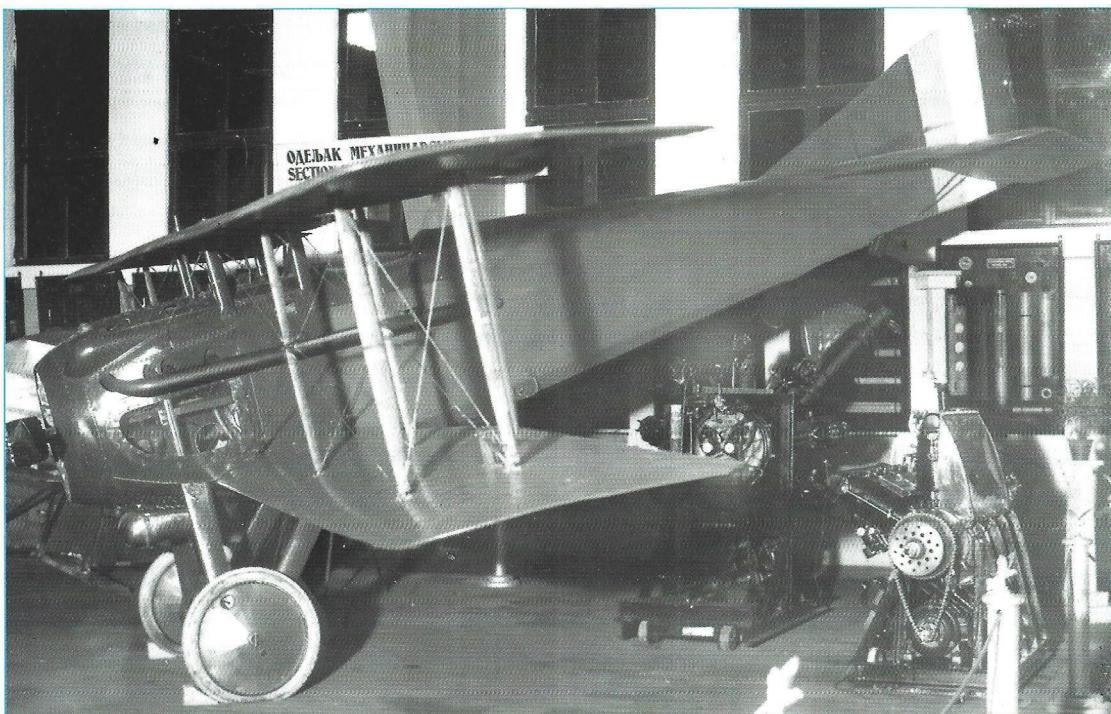
*Souvenir shot during a gloomy winter's day in front of Spad S.7 C1 №6. Judging by the Avia BH-33E fighter in the background, this photo was taken in the very early thirties at an unknown airfield (probably Belgrade-Zemun or Novi Sad). (Robert Čopek)*



*An interesting memorial which reads "For King and Fatherland" at Novi Sad airfield. The leaves on the wreath have names of presumably fallen soldiers. Note a King's bust which is cut into the fuselage. The aircraft lacks any markings. (Šime Oštric)*



*One refurbished Spad 180 KS painted in overall Dark Green with no markings but with the French flag on the rudder was displayed at the First International Air Expo in Belgrade between 28 May and 13 June 1938. (Šime Oštric)*



# Albatros D.III Ba.253 (Oef) (V KSHS Efab D.III)

## Background

The famous German biplane fighter, the Albatros D.III (post war factory designation L.17), was a product of *Albatros-Werke GmbH* from Berlin-Johannisthal. It was designed by engineer Robert Thelen with the assistance of engineers Gnädig and Schubert. The Austro-Hungarian aircraft factory *Österreichische Flugzeugfabrik A.G.*, (abb. Öffag or Oeffag) from Wiener-Neustadt manufactured the type under licence, however it used exclusively domestic engines manufactured by Austro-Daimler, which proved to have improved performance over the original German Mercedes D.IIIa engines. Öffag engineers modified the lower wing and resolved other structural problems as well which existed on the German-built machines.

After the first 16 Albatros D.III Ba.53 (Oef) were ordered in December 1916 (s/n 53.01-53.16), series production of Öffag D.III fighters started. These were produced in three different versions equipped with 185, 200 and 225 mhp engines respectively. By the autumn of 1917 a total of 45 Albatros D.III Ba.53.2 (Oef) were produced, from June 1917 until June 1918 281 D.III Ba.153 (Oef) and finally from May until the end of October 1918 203 (from 230 on order) D.III Ba.253 (Oef), which received serial numbers

*One D.III (Oef), ex 53.57, was partially modified by LFT to incomplete Ba.253 standard. With a skull emblem on the fuselage side but without the s/n on the fuselage it served within the ranks of Ljubljanska eskadrila (Ljubljana Escadrille). (via Čedomir Janić)*



*One of the officers in the Ljubljana Escadrille was por Mihailo Dorčić, ex-CO Flik 51J from LFT who flew aircraft s/n 53.57. The machine behind him is the one with the skull emblem which also belonged to that unit. (Aviation Museum – Belgrade)*



Men from Ljubljanska eskadrila posing in front of their machines after the war. D.III (Oef) with a skull emblem (right) and two-seat Phönix C.I 121.68 (left) are visible. (via Šime Oštrič)

53.20-53.64, 153.01-153.281 and 253.01-253.210 respectively. The last series aircraft were the best Austria-Hungary fighters in World War I, comparable to the French Spad, however they arrived too late to k.u.k LFT.

The D.III Ba.253 fighter had a blunt nose, increased under tail surface, strengthened wing structure and omitted the large spinner. It was a V-strutter biplane of wooden construction armed with two 8 mm Schwarzlose/Steyr M.7/12 machine guns with 250 rounds each. The standard power plant was a six-cylinder water-cooled Austro-Daimler AD 6 Ba.23.000 (in LFT jargon Dm 225) in-line engine with 225 mhp at 1,400 rpm which powered a two-blade wooden Heiduk propeller. The aircraft was robust and effective in service and was very popular with the LFT pilots.

Following the capitulation of the Austro-Hungarian Empire (*Österreichisch-Ungarische Monarchie*), a further 57 D.III Ba.253 were delivered and some of those aircraft joined the newly-formed German-Austrian Air Force in 1919. The Ba.253's post war users were Poland and KSHS. Poland purchased 38 aircraft in the second half of 1919, and two fighter *escadrilles* took part in the 1919-1920 combat against Soviet forces. KSHS used captured Austro-Hungarian D.III Ba.253 fighters.

## Service in the Kingdom

Shortly before the Armistice, the South Slavic air personnel who left LFT formed, on 1 November 1918, an air unit in accordance with the order by *Narodni svet* (People's Council) which became known as the *Letalska stotnija Ljubljana* or *Ljubljanska eskadrila* (*Ljubljana Escadrille*). Within its ranks served one modified D.III Ba.53 with a skull emblem on the fuselage side but without any s/n. One of the officers in that unit was *por* Mihailo Dorčić, ex-CO *Flik* 51J from LFT, who flew the aircraft s/n 53.57. Considering that at that time in Ljubljana there was only a single D.III, it is reasonable to believe that Dorčić's aircraft was the one already mentioned. This machine was LFT modified before the end of World War I, with the engine cowlings and other minor details to Ba.253 standard. As a result, the external appearance of this machine was very similar to the 253 series.

After the creation of KSHS on 1 December 1918, through the union of the Kingdom of Serbia, Montenegro and the territories of the former Austria-Hungary where Southern Slavic people lived, the new Government immediately took measures to collect the remaining Austro-Hungarian and German weapons and military equipment. Novi Sad, Ljubljana and Mostar were designated for storage of aviation materials. As a result V KSHS received a number of captured D.III (Oef) fighters. At least seven serviceable D.III Ba.253 aircraft were immediately introduced into service, and there are some indications that at least one D.III Ba.53.2 was used as well. The war booty included some incomplete aircraft. According to the audit from 24 May 1919 in Ljubljana there were a total of eight captured brand new D.III Ba.253 fuselages in storage without wings and equipment plus two unserviceable D.III Ba.53.2 aircraft which could be repaired when plywood, fabric and lacquer become available.

The Austro-Slovene conflict in Carinthia began at the end of November 1918. It escalated at the beginning of 1919 into a conflict between the newly formed Republic of German Austria (*Republik Deutschösterreich* or *Deutsch-Österreich*) and KSHS. This war at the northern borders of the Kingdom, known by the Slovenians as *Boj za severno mejo* ("Battle for the northern border") lasted until 3 July 1919. Pilot Stabfeldw. Johan Svecz flying Albatros D.III 253.183 from *Fliegerhorst* 2a from Klagenfurt airfield, claimed an unconfirmed victory on 2 June 1919. According to the report, at 10:30, a Yugoslav Ufag C.I (UCI) 161.137 "flying low while diving north of Neumarkt, Klagenfurt region, was forced to land". The Yugoslav crew with *nar* Seneković and *por* Burazović were slightly injured. All events are according to the Yugoslav reports.

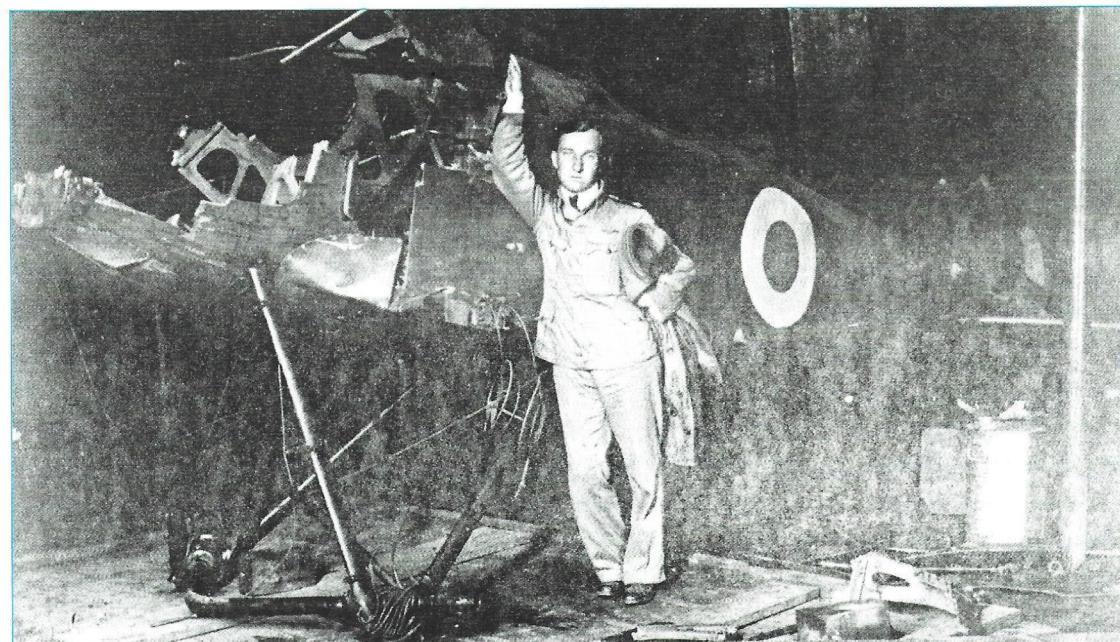


Combat reports from 1919 submitted by the Yugoslav air unit CO *natporučnik* (Oberleutnant rank which corresponds to *poručnik* in KSHS Army) Josip Kos listed all flights, pilots and aircraft belonging to the so-called Ljubljana *Escadrille*, as was named in the report. This name was given by staff of Slovenian descent. The official name from September 1919, according to the stamp in the said document, was *Aeroplanska sekcija* (Aeroplane Section or Aeroplane Detachment) of 4.AE. At the time, the unit had four Brandenburg CI Ba.169 machines, two Ufag CI Ba.161, five Aviatik (Berg) D.I Ba.92 (MAG), one Phönix CI 121.68 and Albatros D.III modified Ba.53 on strength. 4.AE was one of four new Aeroplane *Escadrilles* which were mostly formed in early 1919. After reorganization in March 1921, the 4.AE became AE of 4.AO (*Armijska oblast* – Army District).

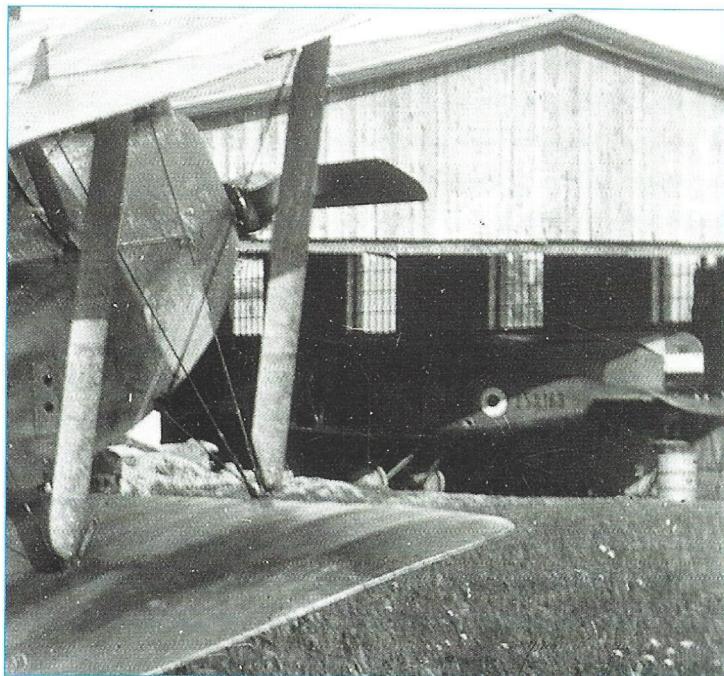
During 1919 and until the end of August of the same year, there were in parallel two aviation and flying units created in the State of SHS (State of Slovenes, Croats and Serbs, note the different disposition of nations at this time), under the original designations, and the newly formed units which belonged to the new country, the KSHS. Frequently the same people belonged to both units (in accordance with the structure of the State of SHS Army and the KSHS Army formation), in the same place! In Slovenia the Ljubljana *Escadrille* in Ljubljana became *Aeroplanska sekcija 4.AE*, in September 1919.

D.III 253.163 from the Aeroplane Section took part in combat flights. On 4 May 1919, 4.AE formed a new unit, Aero Detachment Koprivnica (*Аеропланска ескадрила Копривница*), to which two fighters (D.III 253.163 and Aviatik DI 238.53) and two Brandenburgs were assigned. The unit's CO *por* Mato Schwarz took off on 19 May 1919 from Zagreb to Koprivnica for alert duty with s/n 253.163. The same pilot, also at Koprivnica, crashed aircraft s/n 253.77. The unit was disbanded by the mid August of the same year.

Two shots of V KSHS pilots in front of a modified D.III (Oef). Note the three-tone wheel cover and skull emblem. (both Šime Ostrić)



Por Mato Schwarz pictured in front of the remnants of his D.III (Oef) 253.77. On the reverse of the photo there is a hand-written note in German: "D.III, Kraxe Koprivnica Oblt Mato Schwarz". (Aviation Museum – Belgrade)



Albatros D.III s/n 253.163 with its tail propped up in a hangar during maintenance. At the left of the photo the wing and nose of two-seat Ufag C.1 161.143 are visible. Note the roundel and the original large LFT s/n on the Albatros' fuselage and the Yugoslav flag across the entire rudder. Until 1924 D.III Ba.253 fighters carried non-standard temporary RAF type roundels. (via Aviation Museum – Belgrade)

At the beginning of August 1922, KSHS MVIM (Министарство Војске и Морнарице – Ministry of War and Marine) requested technical drawings from abroad for the D.III (Oef) or older model wings. The Czechoslovaks responded that they did not possess such aircraft nor drawings for them, even though at the time in Czechoslovak Republic there were 13 captured Albatros aircraft, which were not in service. This request by the MVIM shows that there were no plans to acquire new aircraft and that the continued use of the Albatros D.III (Oef) was planned. This is not unusual since the aircraft quality was very high and it was comparable to the French Spad. The D.III was somewhat slower but it had excellent manoeuvrability and climb rate, and was simple to handle and very reliable.

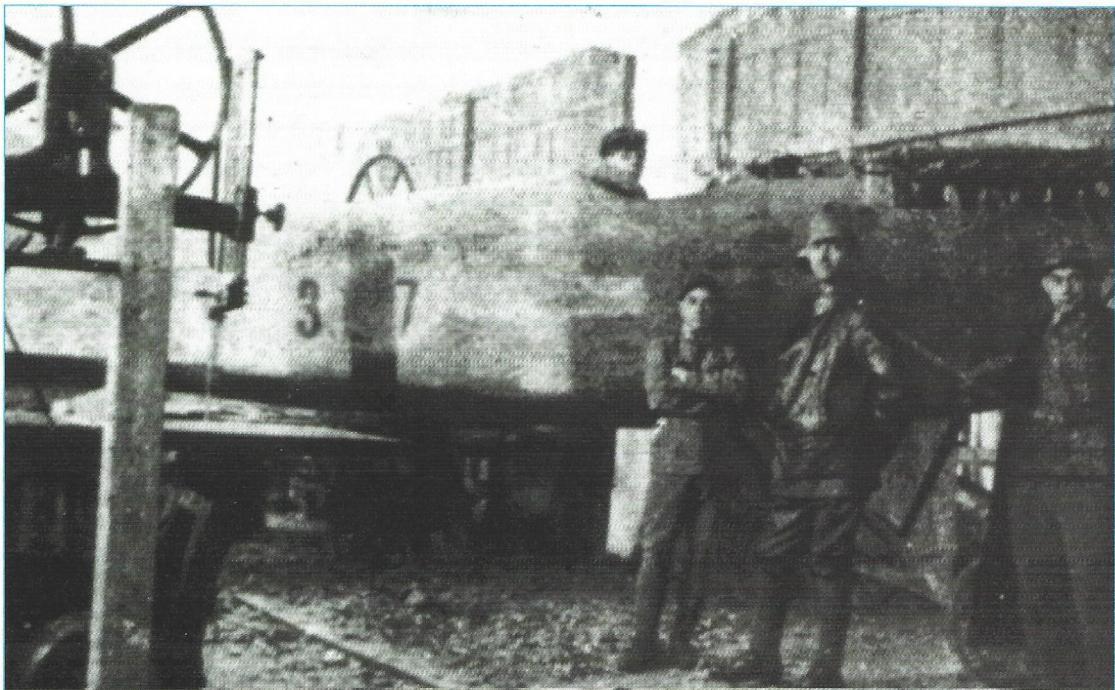
The wing problem was resolved by the newly formed Rogožarski factory in Belgrade, which manufactured in 1924 and 1925 a total of nine pairs of wings for "Albatros monoplace" (for eight captured fuselages and one damaged aircraft). This enabled the overhaul in 1.AR (Аеропланска радионица – Aeroplane Workshop) and introduction into service of nine practically new Albatros D.IIIIs. These aircraft served from 1925 until the end of the 1920s. Some of them were modified with less powerful Austro-Daimler engines.

Due to the incomplete data, only some facts about the Albatros in V KSHS service are known. Aircraft s/n 253.169 and s/n 253.170 were stationed at Ljubljana. In 1924, they were at Novi Sad in unserviceable condition. One of the Albatros machines at Novi Sad was confirmed to be a Ba.53.2 with 185 mhp engine. On 23 July 1926 *nar* Grgić crashed while flying s/n 253.170, flipping the aircraft over. During the same year at Novi Sad, D.IIIIs began to be used in the fighter trainer role. Aircraft s/n 253.169 also suffered a crash at Novi Sad, however the date of this incident is unknown.

Until 1926 when French Spads were the standard fighters, Albatros (Oef) aircraft flew with the Fighter Detachments belonging to the Aeroplane (Observation/Recce) *escadrilles*. From 1925, when their numbers increased with nine aircraft completed by 1.AR, they were used exclusively as training aircraft, replacing the captured Aviatik D.I and Phönix D.II fighters. In the second half of the 1920s D.III Ba.253 flew within PS 1.VP in Novi Sad with White training stripes applied on the fuselage.

The number of D.III (Oef) Ba.253 in use within the V KSHS is estimated to be at least 18.





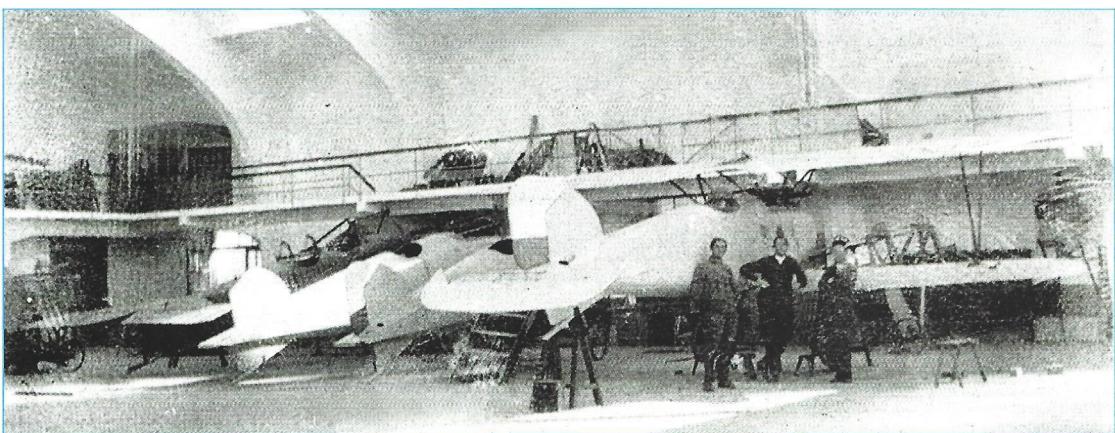
Two shots of captured D.III (Oef) at Zagreb's Aeroplane Workshop: (top) fuselage in a hangar during repair; (below) aircraft without tires and insignia.

Note two stripes around the fuselage, which remained from the ex-LFT unit, partially covering the c/n. Rear White stripe was applied over the first part of the c/n (253), while the Red stripe partially covered the individual aircraft number. The first cipher (1) and the third (7) are clearly visible, while the second cipher (maybe 1?) remains unknown. (both Marko Babić)



## D.III (Oef) Ba.253 Modified

In 1923 Detachment of AE 2.AO at Mostar airfield had at least three D.III Ba.253 aircraft powered by Hiero engines. The water-cooled in-line Hiero Typ H Ba 34.000 (factory designation Typ H2, known in LFT jargon as H 230) had 230 mhp nominal power at 1,400 rpm and maximum power of 240 mhp at 1,500 rpm. Considering that the Oeffag factory installed exclusively Austro-Daimler engines in its licence-built Albatros aircraft, it is clear that the conversion to Hiero engines took place in V KSHS service in a local workshop. The conversion took place out of a necessity, to keep the aircraft in flying condition. At least three aircraft were converted and these continued in service within 9. Escadrille



Three V KSHS Albatros machines in a hangar at Novi Sad undergoing overhaul and repainting. Two of them are without wings and rudder. Photograph was taken in the mid twenties, as the new Light Grey camouflage is applied on all three machines. (Djordje Nikolić)

Two shots of an unknown machine at Mostar airfield, surrounded by pilots and other V KSHS personnel.

Note the fully enclosed engine, which was rare for D.III (Oef) fighters within V KSHS service. (both Šime Oštrić)



under the command of *kap* Petar Vukčević. This *Escadrille* was formed during November 1924 within 2.VK at Mostar airfield.

Since the original 225 mhp Austro-Daimler AD 6 Ba.23000 (known as Dm 225) engines were at the end of their useful life, and there were no spares available or the ability to purchase new ones, the Air Force was forced to install on some Ba.253 aircraft the equivalent size but less powerful engines from the same manufacturer. These were the six cylinder in-line Austro-Daimler AD 6 Ba.19.000 (Dm 200) with 200 mhp at 1,500 rpm and Ba.18.000 (Dm 185) with 185 mhp at 1,400 rpm. Less powerful engines were installed in D.III Ba.253s most likely in 1925, at the time the nine pairs of wings were delivered from Rogožarski. The modified Albatros flew at Novi Sad during the second half of the 1920s. *Por* Janko Dobnikar's pilot logbook contains records of flights made in 1927 on Albatros D.III 180 KS s/n 253.19 with engine 23074 and s/n 253.93 with engine 18411.

With the installation of less powerful engines, the flying characteristics suffered and were basically equivalent to that of the older version, the D.III Ba.153. This was at the time not of importance since the Air Force used these aircraft for training purposes only, in the role of single seat fighter trainers.

## Camouflage and Markings

### Type designations

In accordance with the German and Austro-Hungarian system, the D designation was used for single seat combat aircraft (*Doppeldecker, Kampfeinsitzer*). The designation used within the LFT was Albatros D.III Oef and its three versions were marked as standard with the addition of Ba. (*Bauart* – series) as follows: Albatros D.III Ba.53 (Oef), Ba.153 (Oef) and Ba.253 (Oef). The official designation used in V KSHS was *Ефаг Д.III* (Efag D.III) or *Ефаг Д.3* (Efag D.3), and the designation according to the engine type was D.III 225 KS. Often, other non-standard designations were used such as *Д.3*, D.3, D-drei and Albatros.

The conversions carried out during V KSHS service were usually designated in accordance with the engines: Oeffag D.3-Hiero, D drei Hiero, Albatros D.III 200 KS and Albatros D.III 185 KS.

## Serial numbers

The Austro-Hungarian serial number system for LFT aircraft assigned serial numbers which consisted of two parts with a full stop between them. The first parts were 53, 153 or 253 (related to *Bauart*), while the second parts were individual aircraft numbers, beginning from 01.

The captured Ba.253 aircraft within V KSHS service used the original s/n. The first known machine was 53.57 with the skull emblem. According to the available records, the known serial numbers of Ba.253 aircraft within V KSHS were: 253.19, 253.77, 253.93, 253.163, 253.169, 253.170 plus a fuselage from a damaged aircraft with partially known s/n 253.1x7.

During initial service with V KSHS, D.III fighters had the original Black s/n applied on the fuselage sides. After the introduction of the new camouflage scheme, s/nos were also applied on the fuselage, however the font changed to one seen on French aircraft.

## Camouflage schemes

During the first few years, D.III fighters retained the original LFT camouflage scheme. The fuselage had varnished wood finish, with hand brush, sponge or spray applied Dark Green patches, however some examples lacked them. The fabric on the wing undersurfaces and the horizontal stabilizer remained in natural varnished linen, while the upper surfaces also had Dark Green patches applied. Metal surfaces remained in natural Aluminium.

The second camouflage scheme carried was standard for V KSHS fighters, and it was introduced in the early 1920s. The aircraft were painted overall Silvery Light Grey, similar to the French Nieuport fighters from the second half of World War I. Some aircraft had their struts painted Dark Grey. This second scheme was used as well on converted aircraft within 9. *Escadrille*.

According to the new rules, V KSHS training aircraft were marked with a White stripe along the fuselage sides and this was applied on the Albatros as well.

## Markings and inscriptions

Until 1924 D.III (Oef) Ba.253 fighters carried non-standard national markings, RAF type roundels (Blue/White/Red with Blue in the outer ring), at four positions on the wings, instead of the original LFT markings. Immediately after the Great War, the same roundel was applied on the rudder and after 1920 the standard national tri-colour was painted on the rudder in its place. Some examples had small tail tri-colour stripes and some had the tri-colour along the entire rudder surface.

In 1924 new national marking, the so-called "Kosovo cross", was introduced and also applied at four positions on the wings. Along with it the national flag was painted across the entire rudder.

## Aircraft Characteristics\* Albatros D.III Ba.253 (Oef) (V KSHS Efag D.III)

Quantity used:	(min.) 18
Crew:	1
Years of Service:	1919-1929
Span:	9.0 m (25.5 ft)
Length:	7.4 m (24.1 ft)
Height:	2.8 m (9.2 ft)
Wing area:	20.6 m <sup>2</sup> (222 ft <sup>2</sup> )
Engine:	One 225 mhp Austro-Daimler AD 6 Ba.23.000
Empty weight:	776 kg (1,712 lb)
Loaded weight:	1,035 kg (2,282 lb)
Maximum speed:	170 km/h (106 mph) at sea level
Service ceiling:	over 5,000 m (16,405 ft)
Climb to 5000 m:	35 min
Endurance:	2 h
Armament:	Two synchronized 8 mm Schwarzlose/Steyr M.7/12 machine guns

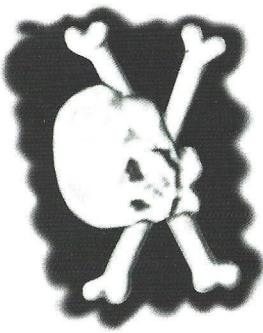
\*The aircraft performance is given for a standard D.III Ba.253 according to the Oeffag company records. Despite these numbers, the lead *k.u.k. Fliegerarsenal* and three series aircraft attained much higher speeds, ranging from 194-202 km/h (121-126 mph), climb time to 5,000 m (16,405 ft) in 21 min 42 s and service ceiling of 5,800-6,200 m (19,030-20,342 ft).

Albatros D.III (Oef) 53.57 mod, Aeroplane Detachment (alias Ljubljana Flying Unit) of 4.AE, V KSIS, Ljubljana airfield, 1919.



Note the absence of standard LFT serial numbers and nose inscriptions. Three colour wheel cover and 50 cm diameter British style roundel were applied on the rudder instead of LFT cross.

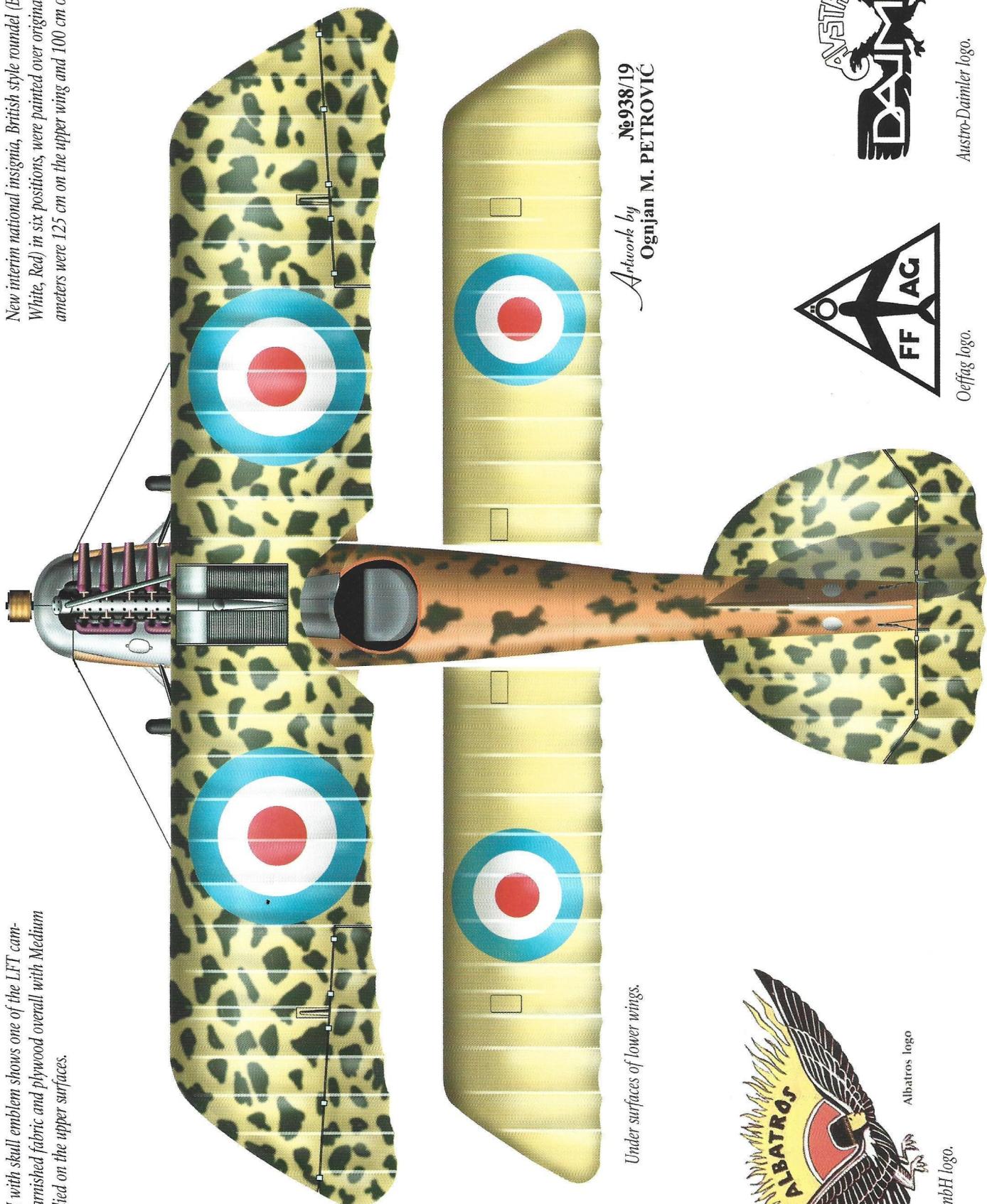
Airplane Detachment's personnel poses in front of D.III (Oef). This machine was modified in LFT Workshop before the end of the Great War. A less powerful Austro Daimler Dm 185 engine was installed, while the Ba.253 engine cowlings and other minor details were incorporated. Note that the machine guns are dismantled and the top engine cowling is removed. (Manko Lična via Mario Hrelja)



Skull emblem taken over from LFT.

Upper view of D.III with skull emblem shows one of the LFT camouflage schemes, varnished fabric and plywood overall with Medium Green patches applied on the upper surfaces.

New interim national insignia, British style roundel (Blue outer ring, White, Red) in six positions, were painted over original LFT crosses. Diameters were 125 cm on the upper wing and 100 cm on the lower wing.



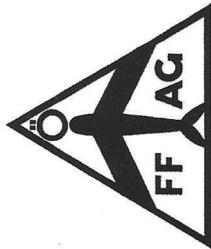
Under surfaces of lower wings.

*Artwork by*  
№938/19  
Ognjan M. PETROVIĆ



Albatros logo

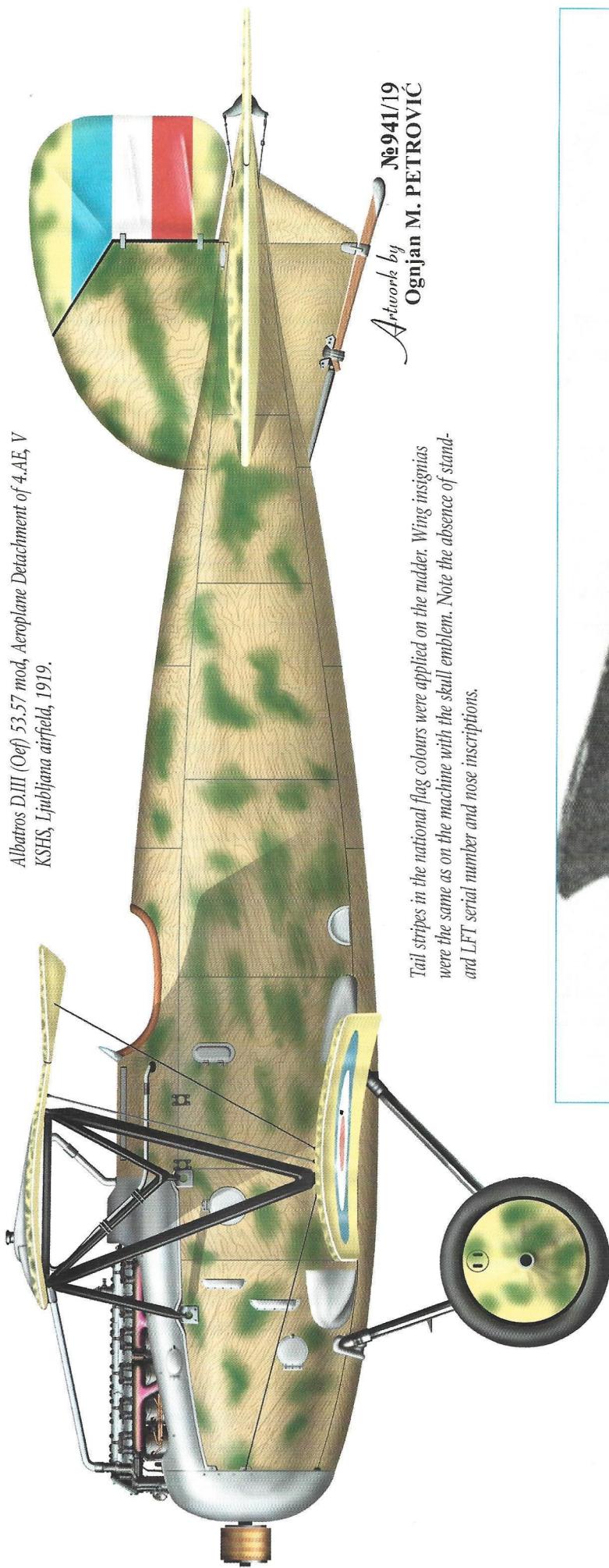
Albatros Werke GmbH logo.



Oeffag logo.



Austro-Daimler logo.



Artwork by  
№ 941/19  
Ognjan M. PETROVIĆ

Tail stripes in the national flag colours were applied on the rudder. Wing insignias were the same as on the machine with the skull emblem. Note the absence of stand- and LFT serial number and nose inscriptions.



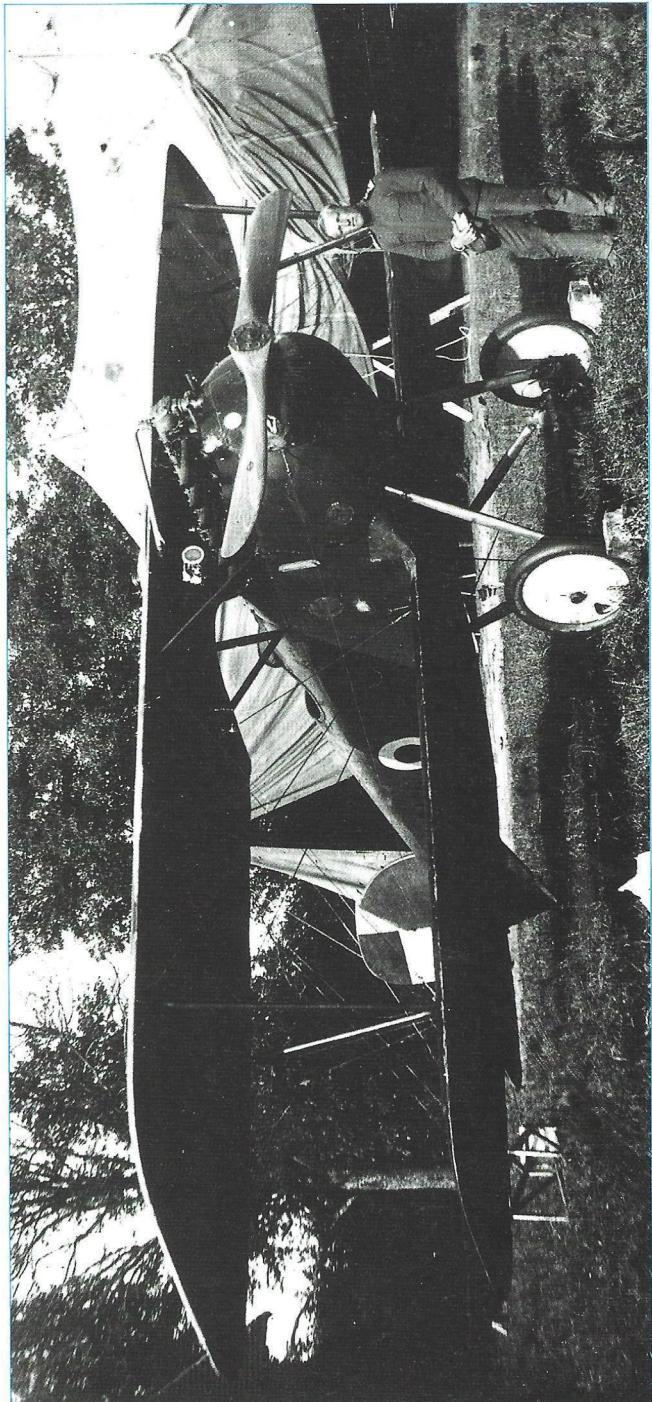
Fuselage remained in plywood with Medium Green mottles which were weathered and whitened.

The pilot wearing a helmet is sitting in the cockpit of his D.III. Unfortunately, this poor quality photograph only shows the rudder flag but it is evident that the machine still carried a very faded coat of the original LFT scheme, Medium Green mottles over furnished plywood. Note that the machine guns and top cowling are removed. (Sime Oštric)

Albatros D.III (Oef) 253.163, Detachment Koprivnica, 4.AE VKSHS,  
Koprivnica, May 1919



Pilot nar. Nikola Šekulić posing with his Albatros D.III s/n 253.163 at Koprivnica auxiliary airfield near the state border with Hungary in May-June 1919. Note that the machine guns are installed and top cowlings is removed. (Aviation Museum - Belgrade)

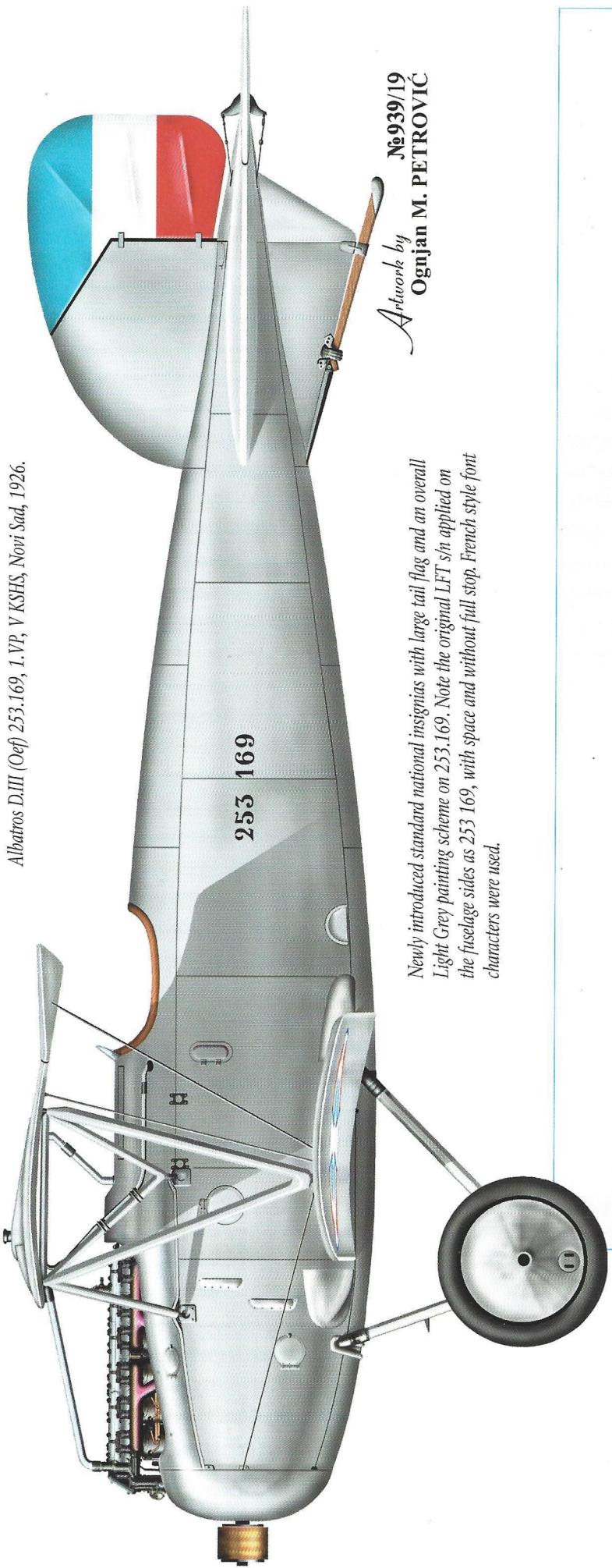


## Alb D.III (Oef) Dm 225 253.163

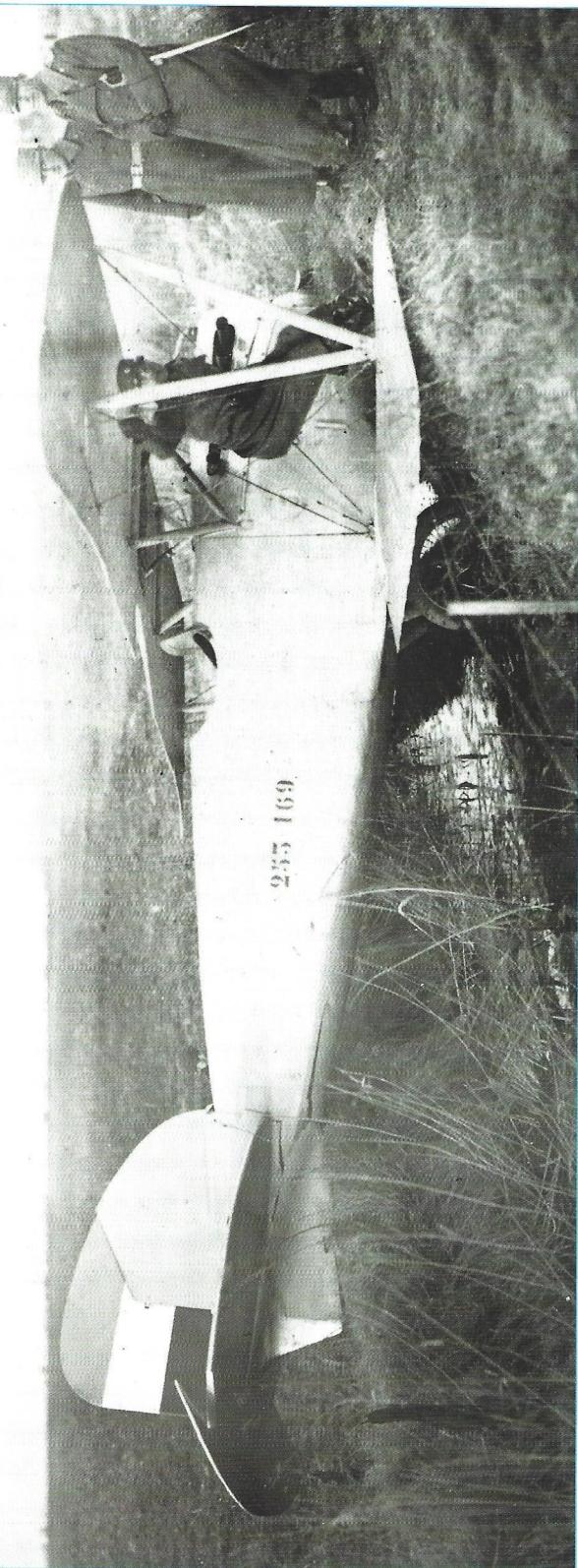
LEERGEWICHT	722 kg
NORM. BETRIEBSSTOFF	139 >
BENZIN-ÖL-WASSER.	
NORM. NUTZLAST	190 >

### RUMPFACHSE

Standard LFT inscriptions on the fuselage nose, port side only  
(aircraft and engine type, s/n and aircraft weights)



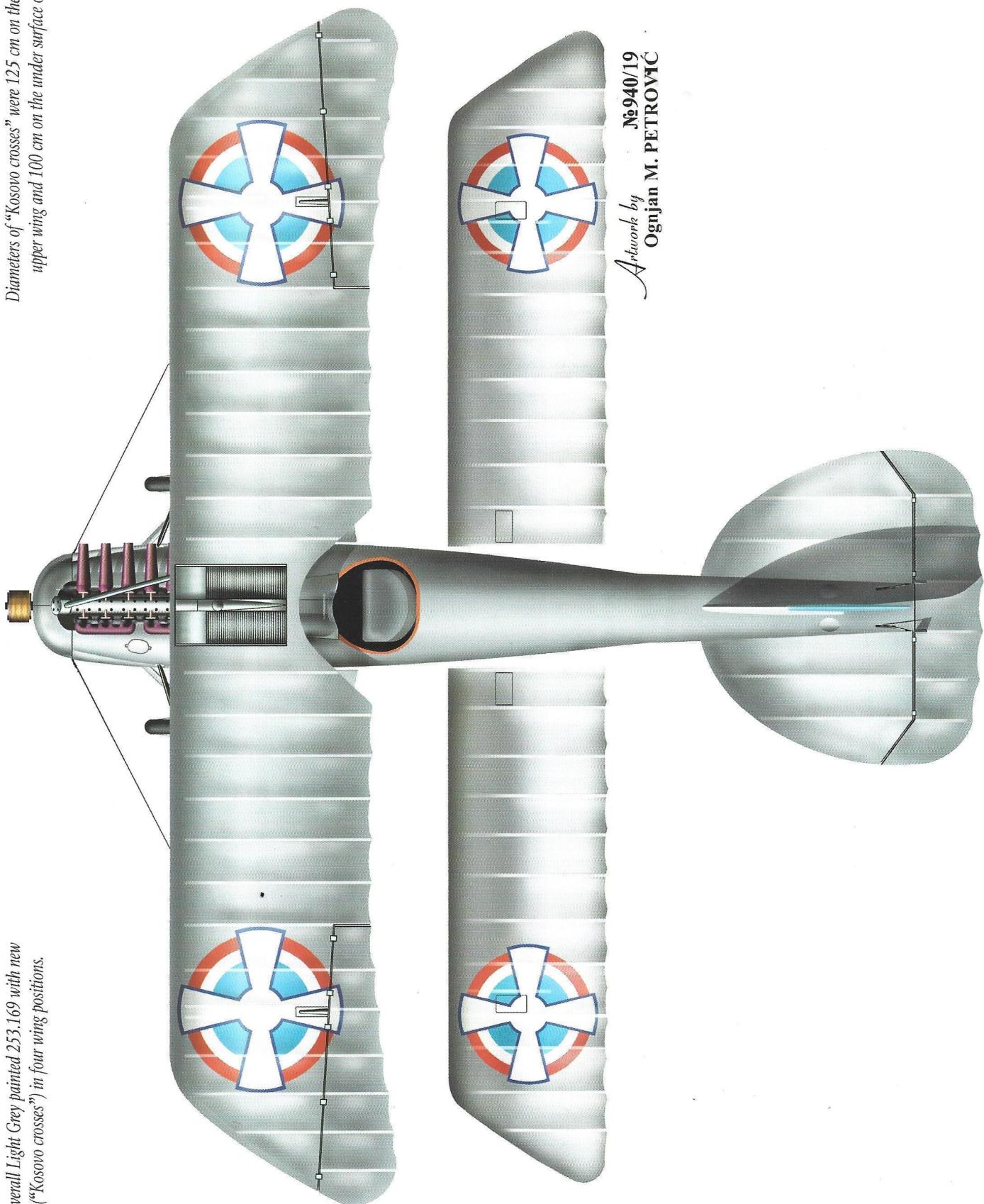
Newly introduced standard national insignia with large tail flag and an overall Light Grey painting scheme on 253.169. Note the original LFT sign applied on the fuselage sides as 253 169, with space and without full stop. French style font characters were used.



Machine guns were dismantled and top cowling removed.

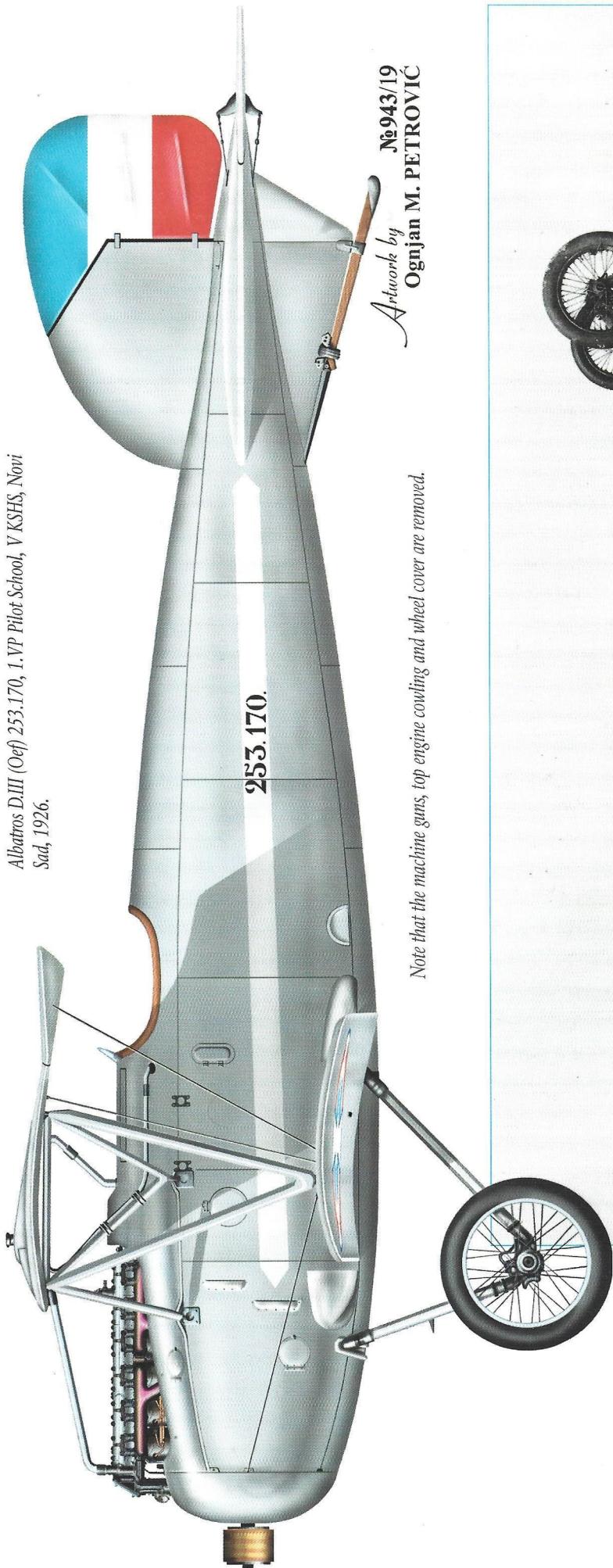
Plan views show overall Light Grey painted 253.169 with new national insignia ("Kosovo crosses") in four wing positions.

Diameters of "Kosovo crosses" were 125 cm on the upper side of the upper wing and 100 cm on the under surface of the lower wing.



*Artwork by*  
№940/19  
Ognjan M. PETROVIĆ

Albatros D.III (Oeff 253.170, 1.VP Pilot School, V KSHS, Novi Sad, 1926.



Note that the machine guns, top engine cowling and wheel cover are removed.



On 23 July 1926 nar Vladimir Grgić crashed while flying the D.III s/n 253.170 belonging to PS 1.VP based at Novi Sad, flipping the aircraft over. Note the newly introduced 15 cm wide White strip along the fuselage identified training machines. (Aviation Museum – Belgrade)

# Phönix D.I & D.II (V KSHS Phönix-Hiero 200 KS & 230 KS)

## Background

Soon after releasing the two seat CI, the Austro-Hungarian factory Phönix (*Phönix Flugzeugwerke A.G.*) from Wien-Stadlau also released a single seat fighter aircraft, the Phönix D.I (factory designation Typ 8). It was intended to compete with the Aviatik (Berg) D.I fighter. The new type originated from the German Hansa Brandenburg KD (designed by engineer Ernst Heinkel), and Phönix manufactured it under licence. The development was led by engineer Leo Kirste with help from engineer Edmund Sparmann. The third prototype from June 1917 was officially accepted as the pattern aircraft for series production. Three series were manufactured at LFT beginning in the autumn, Phönix D.I Ba.128 (31 aircraft), Ba.228 (55) and Ba.328 (34) with 200 mhp Hiero, type H.200, H.200 (Fi) and H.200 (Bd), engines respectively. The water-cooled 6-cylinder in-line engine Hiero Type I (in LFT jargon H 200) developed a nominal power of 200 mhp at 1,400 rpm and maximum power of 215 mhp at 1,500 rpm. Series Ba.128 and Ba.122 were powered by the Hiero Ba.33.000 built by the main factory, *Österreichische Industriewerke Warchałowski, Eisler & Co. AG.*, while the Ba.228 was equipped with the Hiero (Fi) Ba 33.500 licence-built by *Österreichischen Fiat-Werke*. Both factories were based in Vienna.

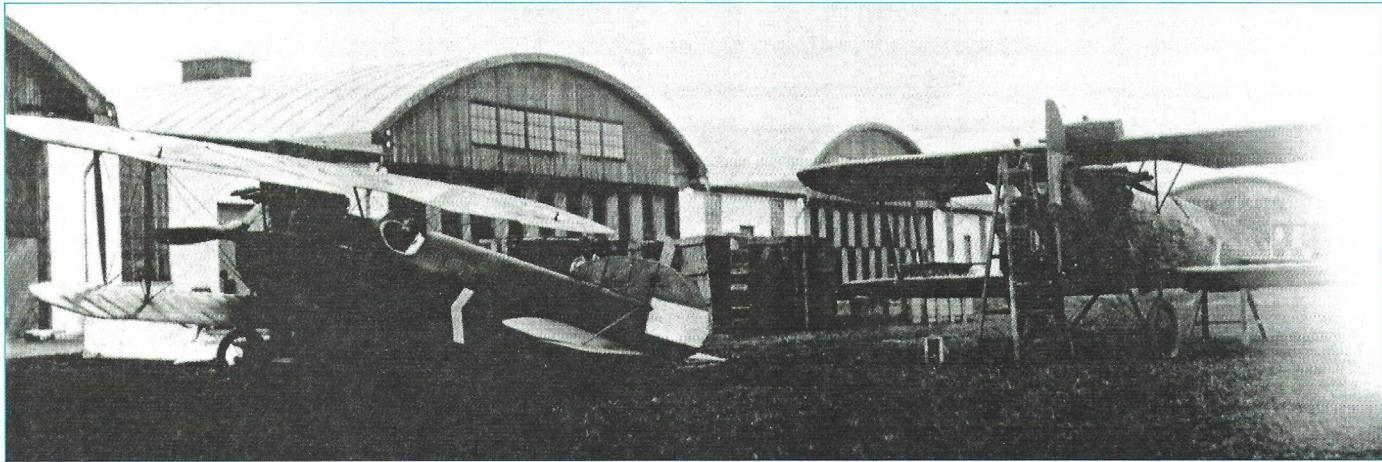
First series machines were completed at the end of 1917, but the service use in LFT began in February 1918. The entire series of 120 aircraft was delivered by the end of spring of the same year. The Austro-Hungarian Naval Air Service, MLW (*k.u.k. Marineluftwaffe*), from October 1917 until March 1918 received 20 D.I Ba.228s, which were at first marked with naval s/nos A97–A104 and A107–A118, and from August of the same year they received new s/nos J1–J20, thus becoming officially *Klasse J* fighters (*Jagdflugzeug* = fighter). Within the MLW they were better known as Phönix-Jäger.

The next, improved and lighter, version was the D.II (Typ 9), with balanced elevators and balanced ailerons on the upper wing, and was manufactured from March 1918 also in three series for LFT. These were Phönix D.II Ba.122 (26), Ba.222 (14) и Ba.322 (9), equipped with Hiero engines, the same as those installed in the D.I. At the beginning of May they entered service with LFT *Fliks*.

At the same time as the D.II, Flars (*Fliegerarsenal* – Aviation Arsenal) ordered the Phönix D.IIa Ba.422 fighter with a new, more powerful 230 mhp Hiero engine. The structure of the D.IIa was identical to

*A pair of Phönix D.IIs captured at Igalo and transferred to 1.E at Pančevo airfield in the spring of 1921. The size of the chevron markings below the lower wings can be clearly seen. The aircraft lack chevrons on the fuselage sides. (Gvidon Gulić family via Marko Ličina and Tomaž Perme)*





*Two Phönix D.II machines at Novi Sad airfield with new style chevron markings, consisting of three bands with national flag colours in six standard positions as well as the national flag applied across the entire rudder.*  
(Aviation Museum – Belgrade via Šime Oštric)

that of the D.II. A total of 48 aircraft (422.01-422.48) were manufactured and the first examples arrived at the front at the end of May 1918. At the beginning of August, LFT had 34 operational D.IIa fighters.

The next version, tentatively designated D.II Ba.222-neu (or 222-100), was intended to use the 200 mhp Hiero (Fi) engine. At the end of July 1918, the factory performed specific modifications and in September an order for 100 aircraft was placed (222-101 to 222-200) under the designation D.III with 230 mhp Hiero engine.

By the end of October none of the 61 completed fighters had been delivered. 50 D.II, D.IIa and D.III aircraft were ordered for the Navy but only 10 D.IIa were delivered from series Ba.422 (J21-J30) and two D.IIIs (J31-J32) modified from the older model. Only the first series D.III (J41) was completed but it did not enter service with MLW before the end of the war. After the Great War, Sweden purchased 17 D.IIIs and manufactured another 10 under licence.

## Service in the South Slav Kingdom

Captured Phönix D family fighters were used by the V KSHS. The exact number of operationally used aircraft cannot be stated with absolute certainty. According to the available information, there were most likely a total of 10, five from LFT and five from MLW. Two D.I Ba.228 aircraft were used immediately after the war in Slovenia, within the Aeroplane Detachment belonging to the Zagreb-based 4.AE. According to the census from 24 May 1919, there were two captured D.I at Ljubljana, unserviceable at this time. 228.51 could have been easily repaired in the workshop while 228.25 required new plywood, fabric and varnish. There were at least two D.IIs at Novi Sad formerly from LFT, but these lacked any serial numbers on the fuselage.

Five ex-MLW D.I and D.IIa Phönix fighters from *Abwehrflugstation Igalo* were captured at the same Austro-Hungarian airfield. Serial numbers of these five aircraft are not known but it is known that Austria-Hungary had, towards the end of the Great War, at least six Phönix fighters in the South Adriatic theatre, of which three were D.I (J.11, J.14 and J.15) and three D.IIa (J.21, J.24 and J.25). It is logical to assume that some of these were captured at the end of the war.

*Two Phönix D.II fighters surrounded by a curious crowd during a public presentation at Pančevo airfield, 1922.*  
(Mario Raguž)





V KSHS mechanic poses in front of an overall Light Grey painted Phönix D.IIa, 422.40, Novi Sad airfield, 10 October 1925. From 1924 standard national markings consisting of the "Kosovo cross" were introduced at four wing locations. "Kosovo cross" was not applied on the fuselage sides. (Sime Oštrić)

Five captured fighters were taken by V KSHS in 1922 and, in a trade for them, the MViM purchased five float planes in Italy for the PV (Поморско ваздухопловство – Naval Air Service). Fighters were transferred from Igalo to Rajlovac (Sarajevo) and then to Novi Sad to equip the Pilot School.

Phönix D versions were originally built for fighter roles, although V KSHS used them as fighter trainers as well. In the pilot logbook belonging to Serbian veteran Janko Markićević, a pilot from World War I, between 1922 and 1923 flights with D.IIa 422.40 within 3<sup>rd</sup> Section PS of 1.VP (the so-called *Chasseur School*) at Novi Sad were recorded. Six Phönix machines were in 1.VP's PS service at the same airfield during 1925 and two were used in 1924 and 1925 only for training of aces, that is the best and most experienced pilots.

## Camouflage and Markings

### Type designations

According to the LFT standard, Phönix D.I fighters received designations in accordance with the manufacturing series (*Bauart*). According to earlier established practice by V KSHS, Phönix D.I Ba.128,

Pilot School at Novi Sad, in the mid twenties. A small group of military personnel and civilians pose, surrounded by four Phönix D.II fighters (in the background) and Spad №23 whose tail is visible on right of the photo. Standing third from the left is the CO of 3<sup>rd</sup> Section of Pilot School of 1.VP, kap Janko Markićević. (Janko Markićević family via Milan Micevski)





V KSHS fighter pilot in front of a Phönix D.II fighter.

Note a "Kosovo cross" under the port lower wing and a "comet" emblem on the wheel cover, left over from an LFT unit. (Šime Oštric)

Accident of pilot por Ferdo Gradišnik, Novi Sad, 9 September 1925. (Šime Oštric)

D.I Ba.228 and D.II Ba.122 fighter types were designated as *Феникс-Хуеро 200 KC* (Phönix-Hiero 200 KS), with respect to the engine power. In practice, V KSHS considered all versions as one fighter type. The philosophy was: same engine – same aircraft. The type with more powerful engines, Phönix D.IIa Ba.422, became *Феникс-Хуеро 230 KC* (Phönix-Hiero 230 KS).

### Serial numbers

Standard LFT s/nos were carried on fuselage sides in the period when these aircraft carried their original camouflage. With the introduction of the new Grey camouflage, the same s/nos were applied on the White band of the rudder flag, however some aircraft lacked it altogether. The known s/nos in V KSHS were 228.25 and 228.51 (both D.Is) and 422.40 (D.IIa).

### Camouflage schemes

During the first few years, Phönix fighters flew with the original camouflage schemes from LFT. The camouflage consisted of small and dense Dark Green spots applied over the varnished plywood and fabric, as well as over the Aluminium metal panels. Some examples had the wings painted in large patches consisting of two colours, Dark Ochre and Dark Green.

The new camouflage scheme for V KSHS fighter types was introduced at the beginning of the 1920s. In accordance with the regulation requirements, Phönix fighters were painted entirely in Light Grey.

### Markings

During the first period of service within V KSHS, some of the Phönix fighters (captured in Slovenia) carried RAF type roundels. After a short period, all Phönix machines introduced chevron type markings which consisted of three bands with the national flag colours. Chevrons were applied in four positions on the wings and varied in size, and the bands intersected at an angle of 120 degrees. There were some examples with chevrons bands made with smaller angles. The chevrons on the side of the fuselage were usually at 120 degrees and were limited by the height of the fuselage. The tips of the chevrons were pointed forward and the Blue colour was always the first one applied.



From 1924 standard national markings consisting of the “Kosovo cross” insignia were introduced at four wing locations. The “Kosovo cross” was not applied on the fuselage sides. National tri-colour flag was applied across the entire rudder.

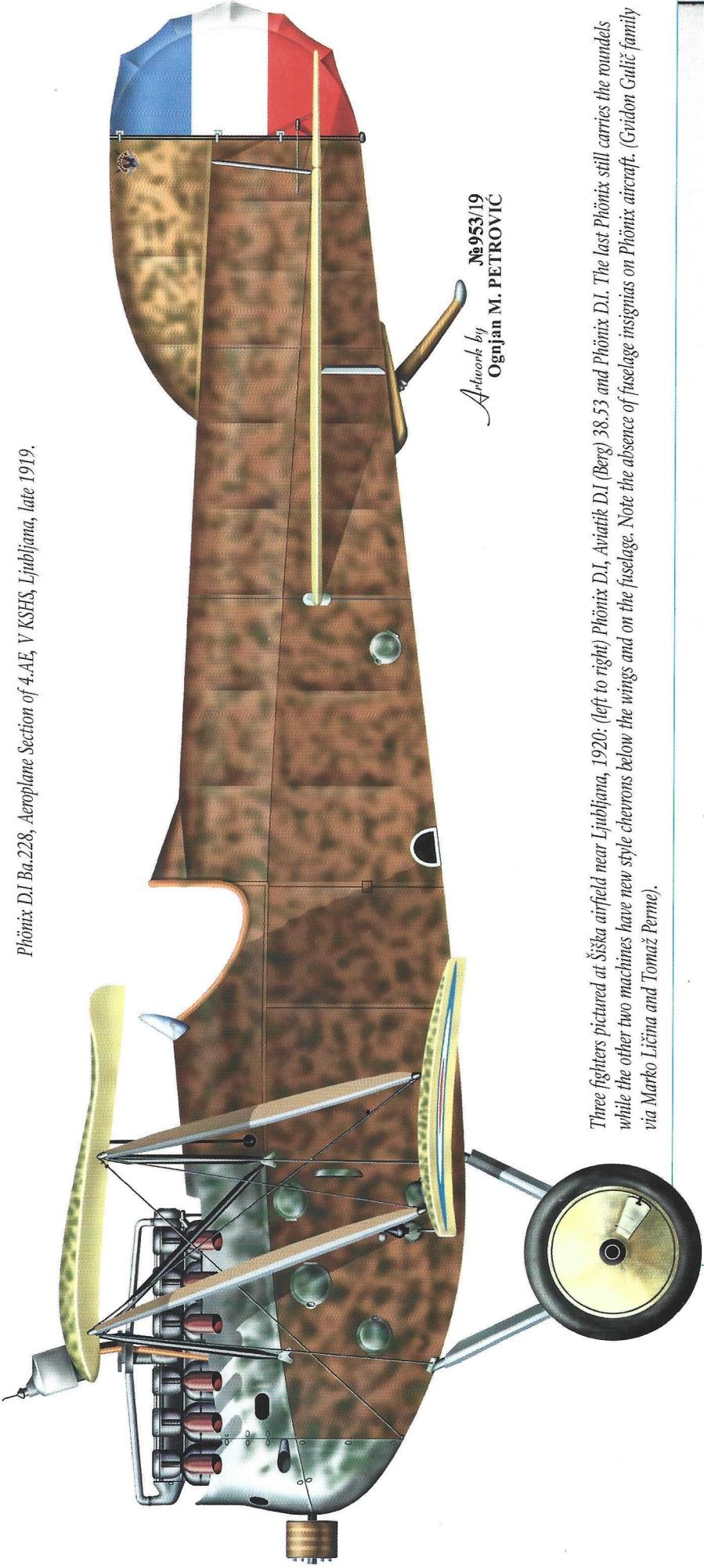
#### Aircraft Characteristics Phönix D.I Ba.128 and Ba.228 (V KSHS Phönix-Hiero 200 KS)

Quantity used:*	(min.) 10
Crew:	1
Years of Service:	1918-the second half of twenties
Span:	9.8 m (32.2 ft)
Length:	6.8 m (22.2 ft)
Height:	2.7 m (8.7 ft)
Wing area:	25.0 m <sup>2</sup> (269 ft <sup>2</sup> )
Engine:	One 200 mhp Hiero Ba.33.000 (H 200)
Empty weight:	716 kg (1,579 lb)
Loaded weight:	951 kg (2,097 lb)
Maximum speed:	178 km/h (111 mph)
Service ceiling:	6,000 m (19,686 ft)
Climb to 5,000 m:	27 min 39 s
Endurance:	2 h
Armament:	Two synchronized 8 mm Schwarzlose/Steyr M.7/12 machine guns

\* Total of all versions (D.I Ba.128, D.I Ba.228, D.II Ba.122 and D.IIa Ba.422) within V KSHS service.

#### Aircraft Characteristics Phönix D.IIa Ba.422 (V KSHS Phönix-Hiero 230 KS)

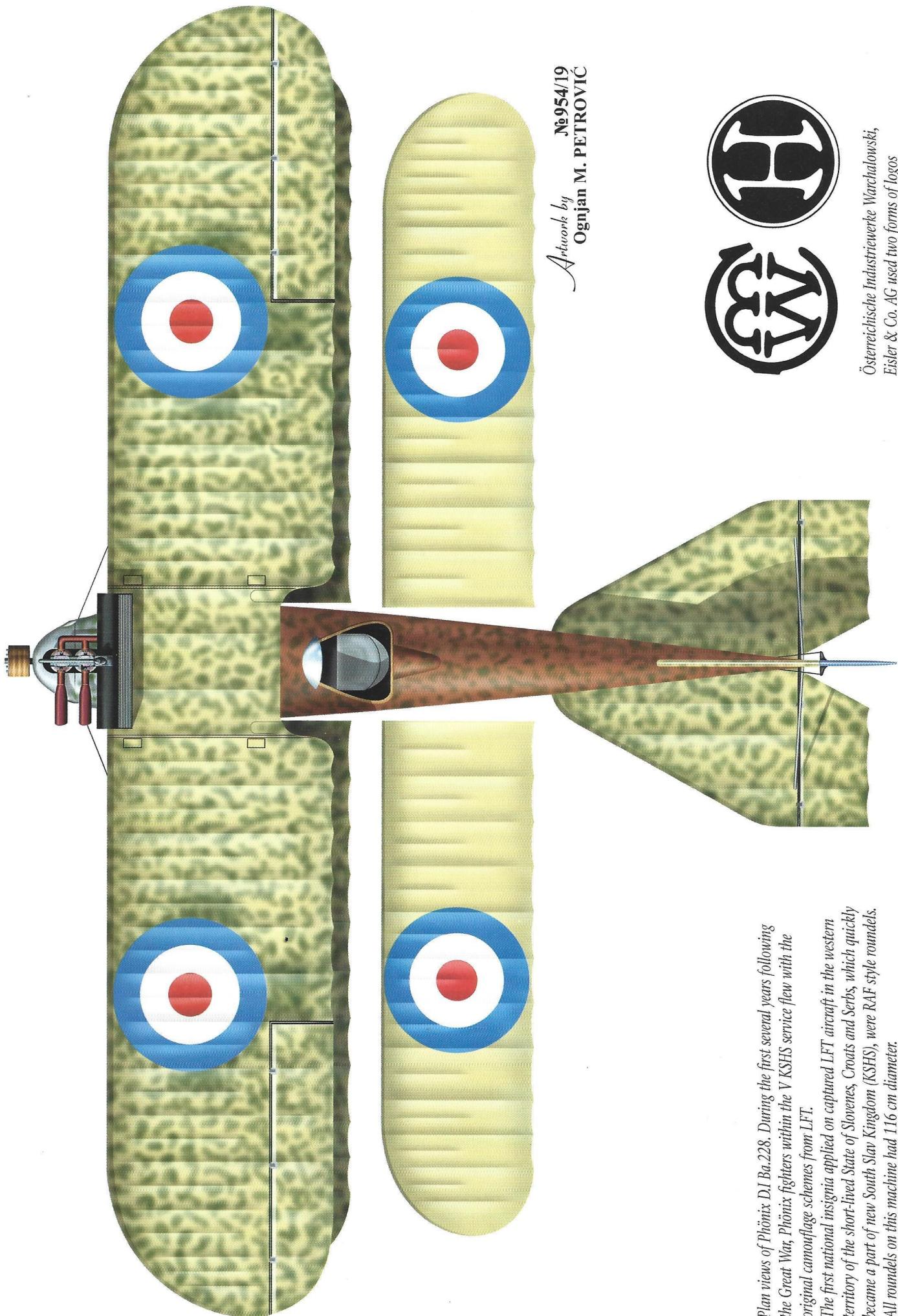
Crew:	1
Years of Service:	1922-the second half of twenties
Span:	9.8 m (32.2 ft)
Length:	6.8 m (22.2 ft)
Height:	2.7 m (8.7 ft)
Wing area:	25.0 m <sup>2</sup> (269 ft <sup>2</sup> )
Engine:	One 230 mhp Hiero Type H Ba.34.000 (H 230)
Empty weight:	665 kg (1,466 lb)
Loaded weight:	810 kg (1,786 lb)
Maximum speed:	190 km/h (118 mph)
Service ceiling:	6,800 m (22,311 ft)
Climb to 5,000 m:	17 min 20 s
Endurance:	3 h
Armament:	Two synchronized 8 mm Schwarzlose/Steyr M.7/12 machine guns



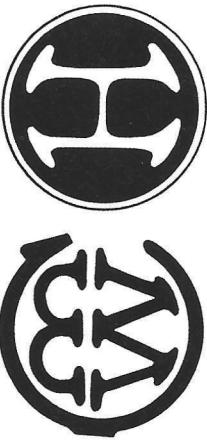
Three fighters pictured at Šiška airfield near Ljubljana, 1920: (left to right) Phönix D.I, Aviatik D.I (Berg) 38.53 and Phönix D.I. The last Phönix still carries the roundels while the other two machines have new style chevrons below the wings and on the fuselage. Note the absence of fuselage insignia on Phönix aircraft. (Gvidon Galič family via Marko Ličina and Tomaž Perme).



Phönix Flugzeugwerke A.G. logo was applied on both sides of the vertical tail.



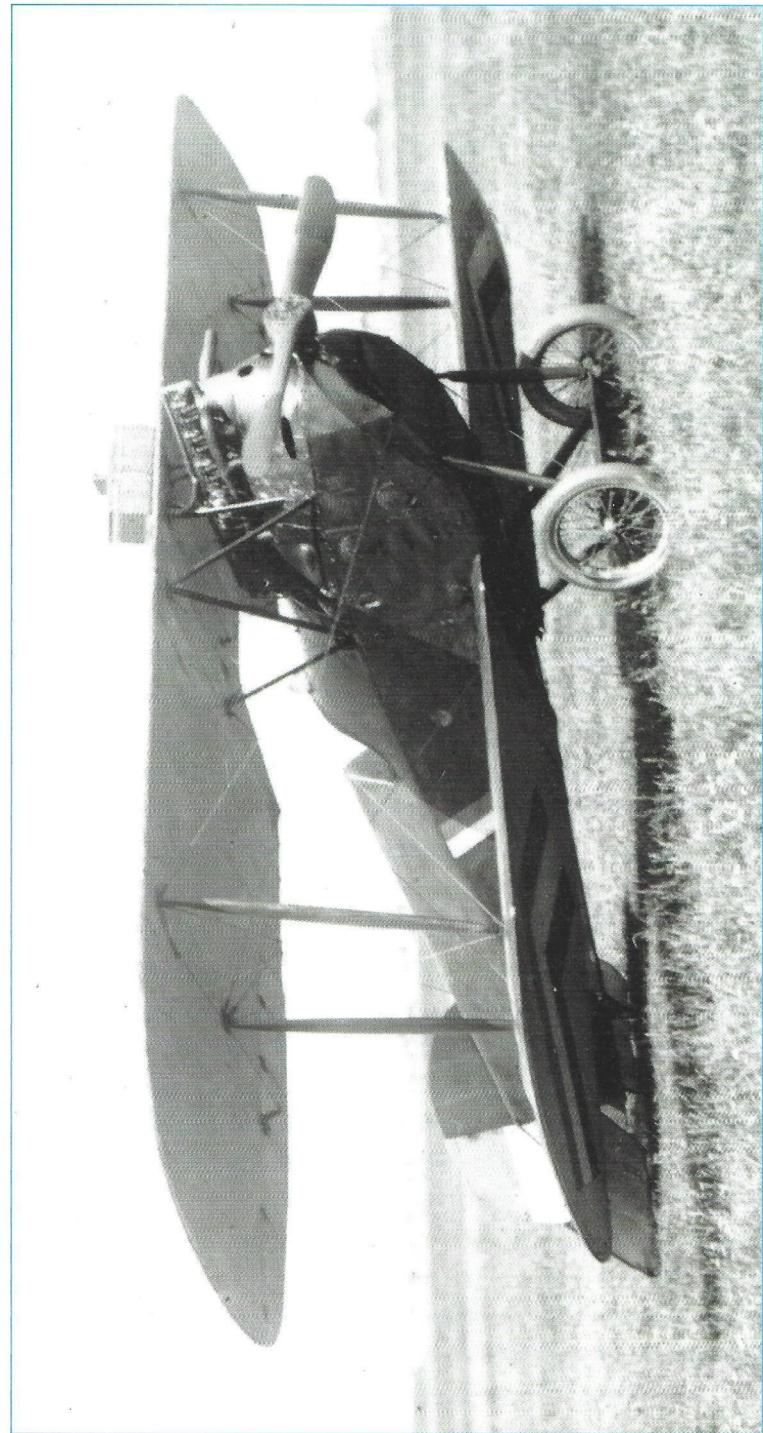
*Artwork by*  
№954/19  
Ognjan M. PETROVIĆ



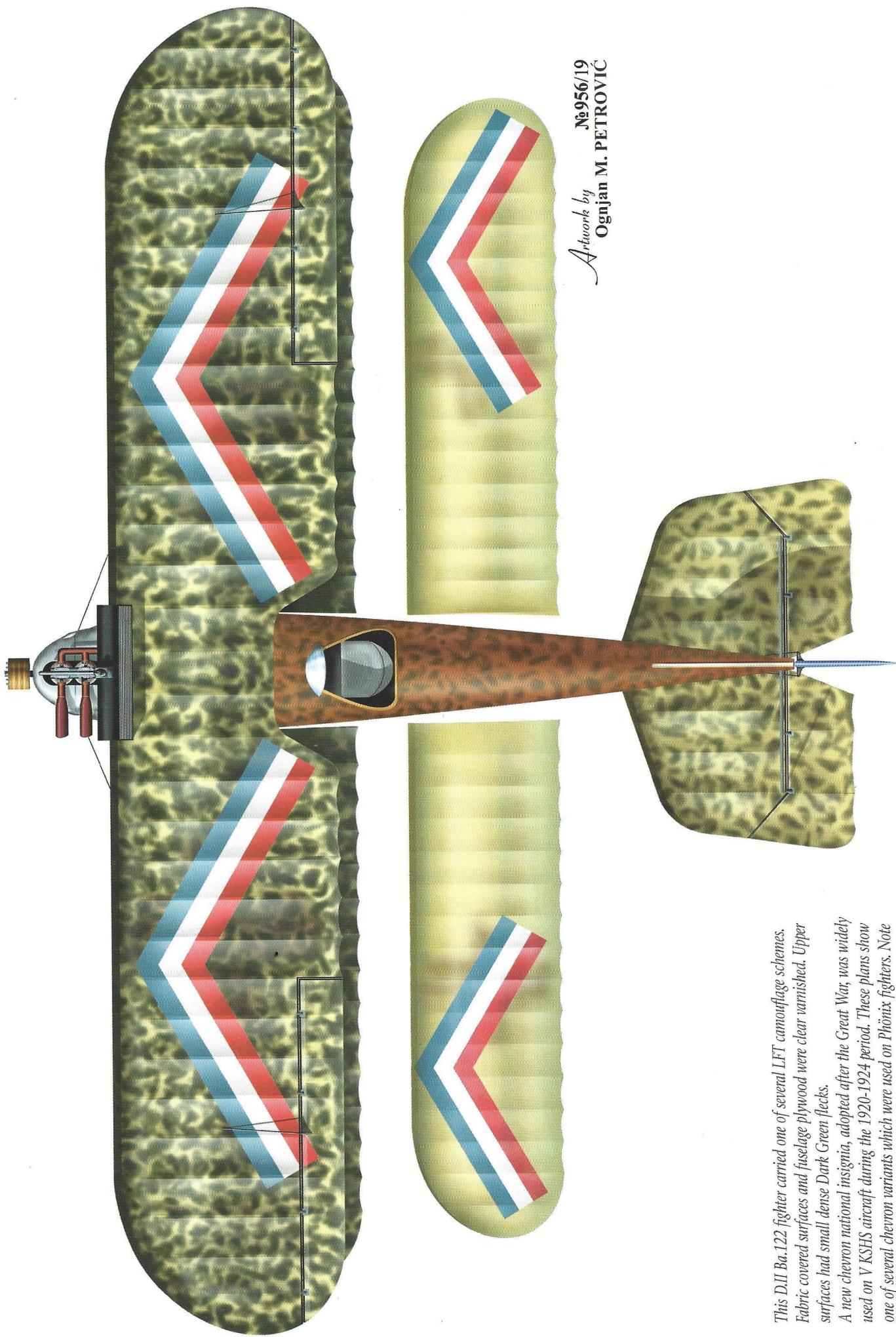
Österreichische Industriewerke Warchalowski,  
Eisler & Co. AG used two forms of logos

Plan views of Phönix D.I Ba.228. During the first several years following the Great War, Phönix fighters within the V KSHS service flew with the original camouflage schemes from LFT. The first national insignia applied on captured LFT aircraft in the western territory of the short-lived State of Slovenes, Croats and Serbs, which quickly became a part of new South Slav Kingdom (KSHS), were RAF style roundels. All roundels on this machine had 116 cm diameter.

Phönix D.II Ba.122, 1.VK, V KSHS, Novi Sad airfield, 1924.



This D.II Ba.122 fighter, pictured at Novi Sad, sports chevrons both below the wings as well as on the side of the fuselage per requirements of the time period. Standardized national flag was applied over the entire rudder surface. (Janko Dobnikar family via Predrag Miladinović)

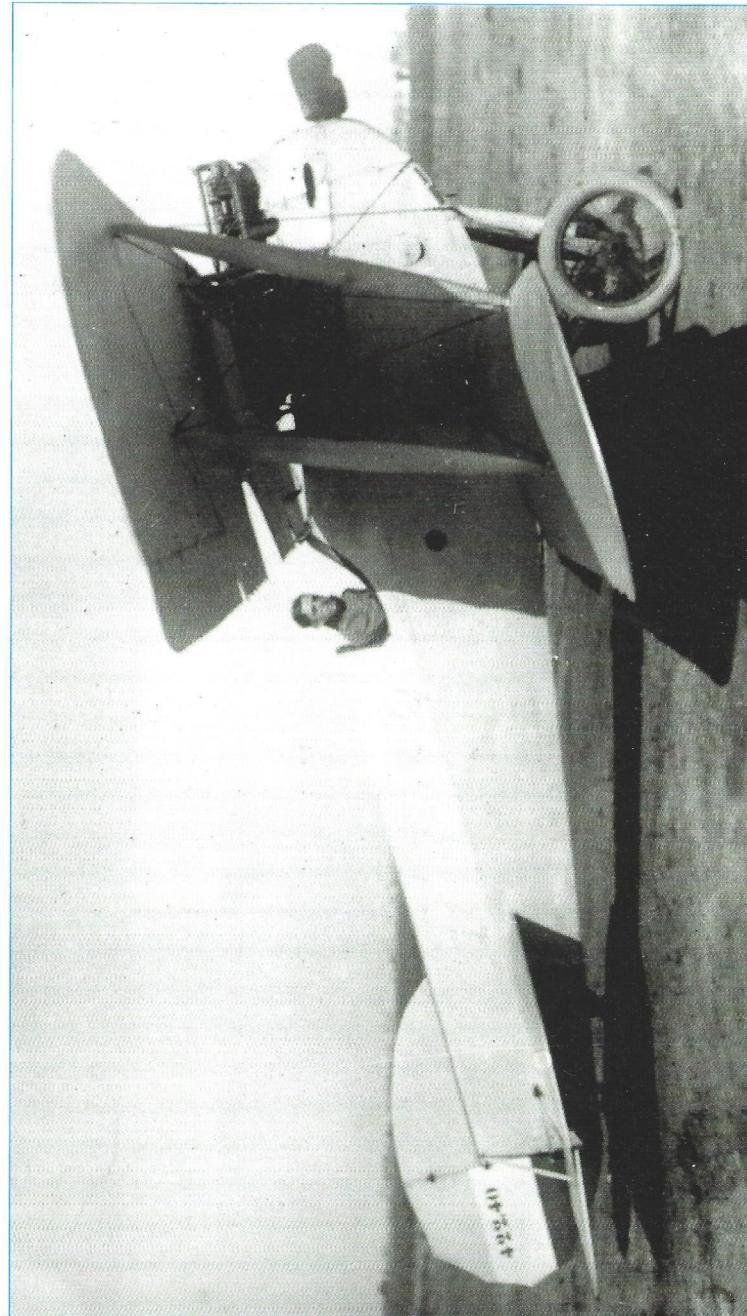


This D.II Ba.122 fighter carried one of several LFT camouflage schemes. Fabric covered surfaces and fuselage plywood were clear varnished. Upper surfaces had small dense Dark Green flecks. A new chevron national insignia, adopted after the Great War, was widely used on V KSHS aircraft during the 1920-1924 period. These plans show one of several chevron variants which were used on Phoenix fighters. Note the very large chevrons on the upper wings.

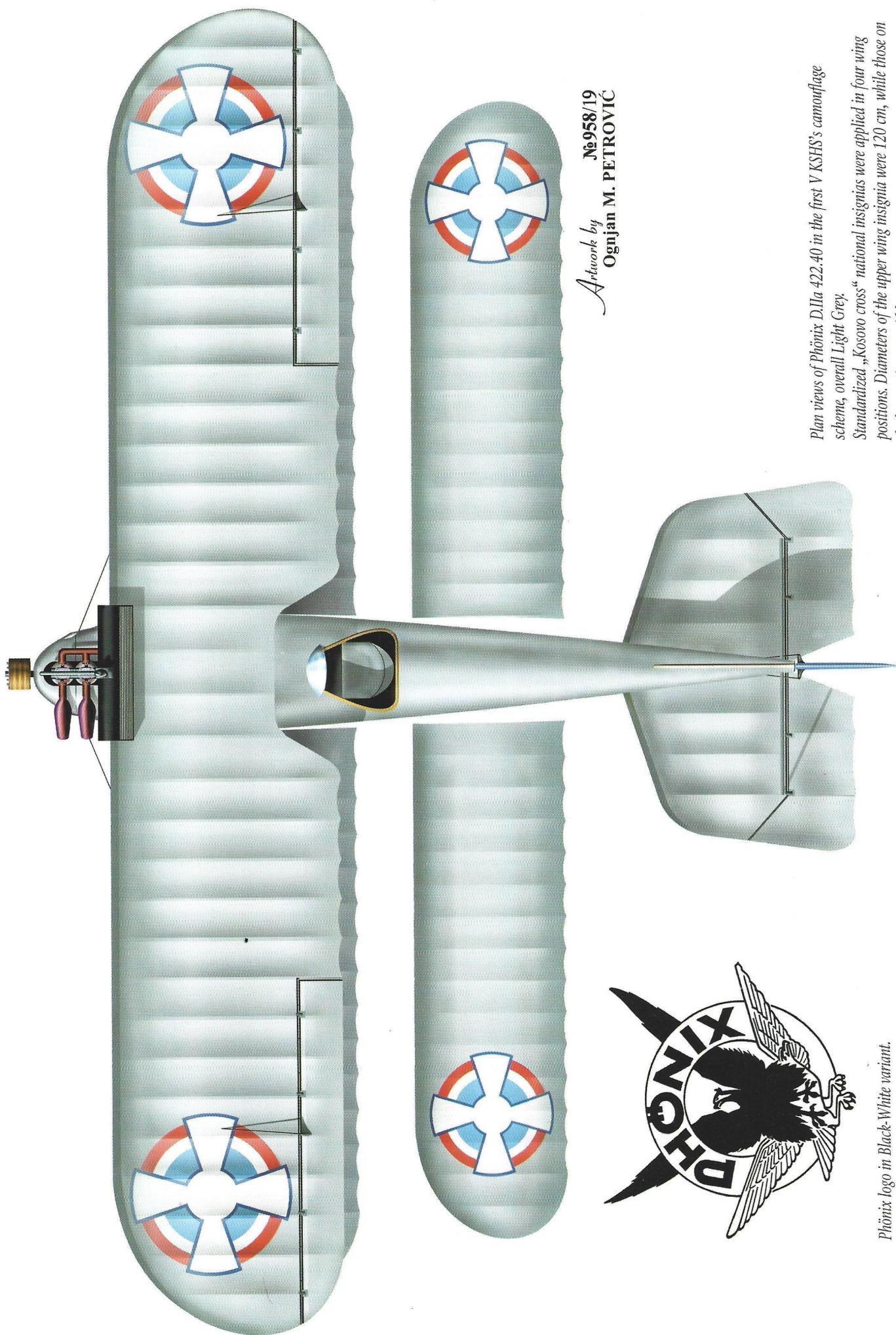
Phönix D.IIa 422.40, 1. VP's Pilot School, V KSHS, Novi Sad airfield, 1925.



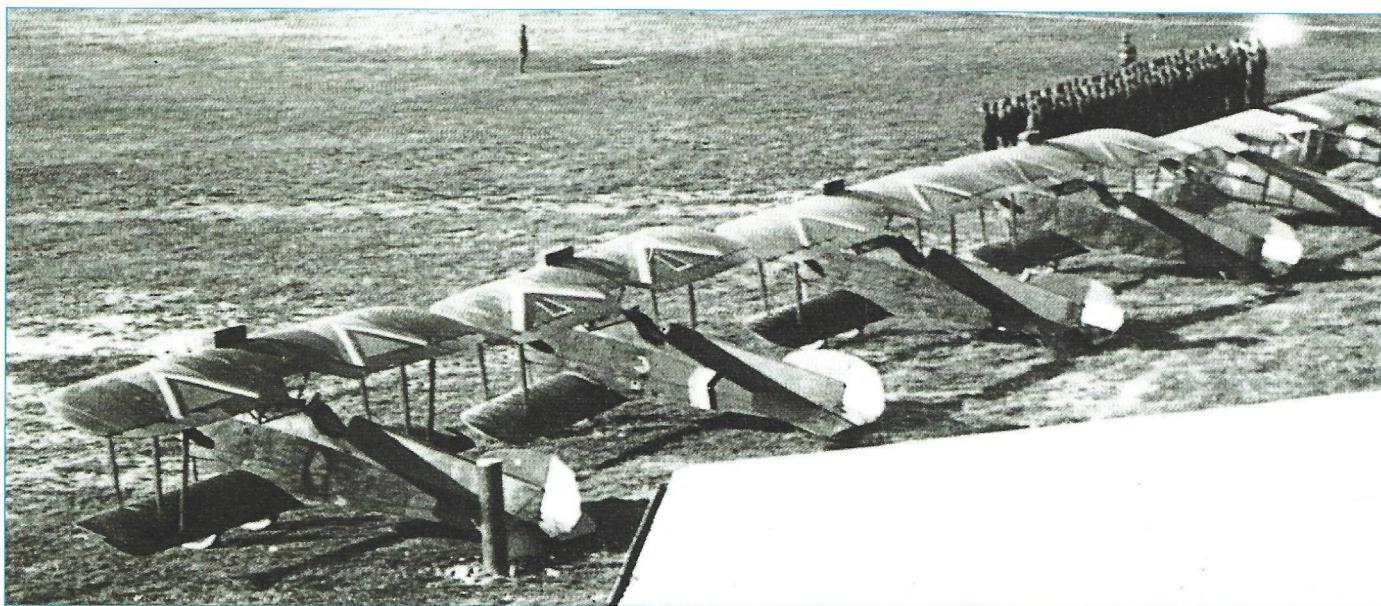
*Adwoj by  
Ognjan M. PETROVIC*



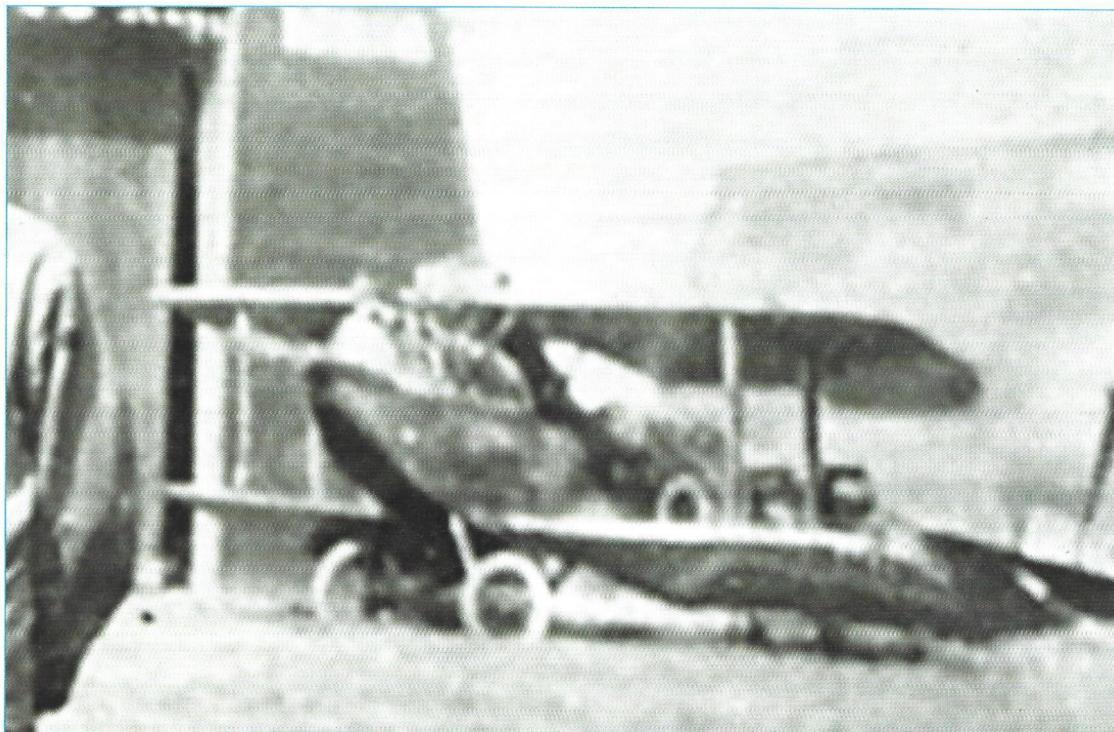
D.IIa 422.40 with new camouflage scheme for fighter types, which was introduced at the beginning of 1920s. As a result, all serviceable Phönix aircraft were painted entirely Light Gray. Note the original LFT s/n applied over the mader flag in French style font. (Anto Marković family via Milan Micevski)



Plan views of Phönix D.IIa 422.40 in the first V KSHS's camouflage scheme, overall Light Grey. Standardized "Kosovo cross" national insignia were applied in four wing positions. Diameters of the upper wing insignia were 120 cm, while those on the lower wing were 100 cm.

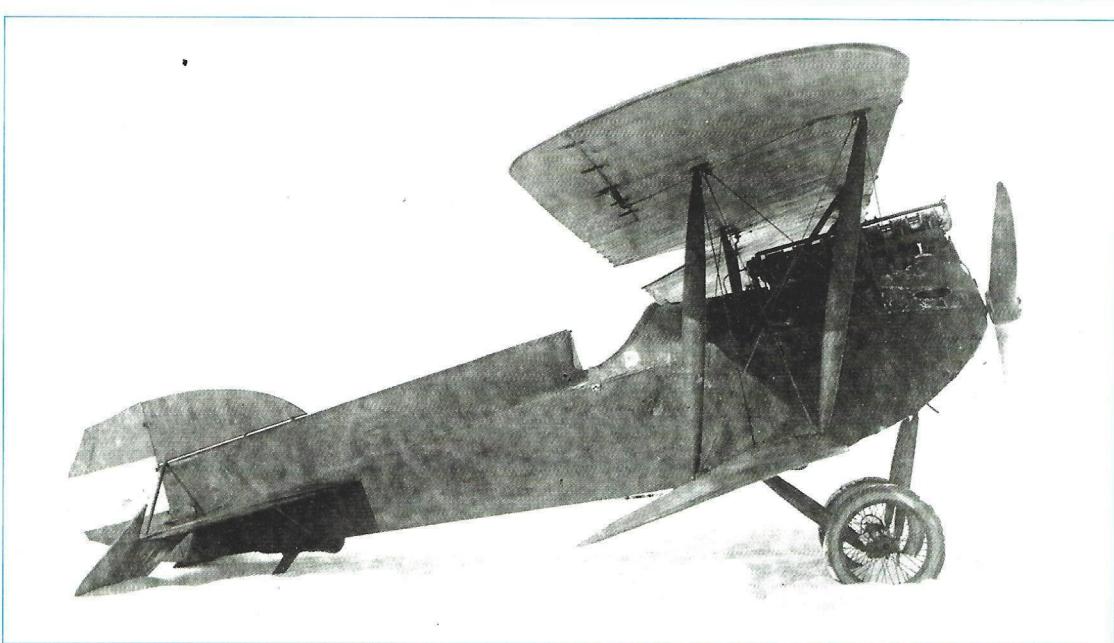


*Above: Four camouflaged Phönix fighters, one D.IIa (the first from the left) and three D.II versions, pictured at Novi Sad in 1923. The first aircraft clearly shows where the LFT cross and then V KSHS roundel were overpainted and a new chevron applied instead on top of the wings. The second aircraft is the only one which has a fuselage chevron, but interestingly it sports a much thicker chevron on the top of the wings as well as a curious looking rectangle in the centre of each chevron, which makes it look more like an arrow. (Kees Kort collection)*



*Mid: This poor quality photo from Novi Sad airfield shows rare dual type national insignia during the first post war period, RAF style roundels on the fuselage sides and chevrons on the wings. (Djordje Nikolić)*

*A winter photo of a Phönix D.II taken at Novi Sad in the early 1920s. The aircraft is still painted in the original LFT scheme. Note the absence of fuselage insignia. (Rade Samolov via Tomislav Aralica)*



# Aviatik (Berg) D.I (V KSHS Aviatik)

## Background

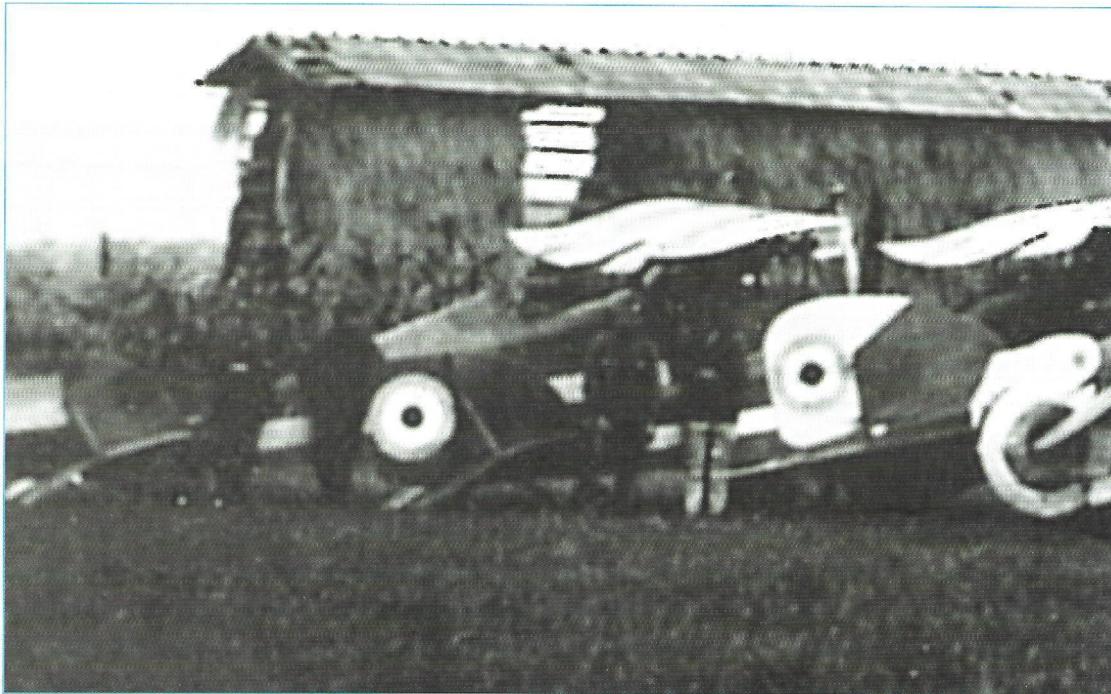
Obering Julius von Berg developed a D Class single-seat fighter (*Jagdeinsitzer*) in parallel with the two-seat CI. Within LFT service it was designated as Aviatik (Berg) D.I or Aviatik D.I Berg and in Austria-Hungary it was known simply as „*Berg-Einsitzer*“ (Berg single seater). It represented the first fighter type designed in Austria-Hungary and the most numerous one within LFT, with 677 series machines delivered. The number of aircraft on order was greater but the production of parts for series aircraft was halted due to the end of World War I. According to known records, 677 of 983 ordered Aviatik D.I machines were taken over by Austro-Hungarian military authorities by 31 October 1918. The main factory, Aviatik (Oest-ung. Aviatik – Oesterreichisch-Ungarische Flugzeugfabrik Aviatik Ges. m. b. H.) from Wien-Heiligenstadt, manufactured four series (71 delivered / 72 ordered Ba.38, 87/88 Ba.138, 120/120 Ba.238, 58/108 Ba.338). Licence manufacture was also carried out at W.K.F. (10/10 Ba.84, 1/24 Ba.184, 24/24 Ba.284, 10/40 Ba.384), M.A.G. (121/172 Ba.92), Thöne & Fiala (25/51 Ba.101, 9/9 Ba.201), Lohner-Werke (88/89 Ba.115, 22/76 Ba.315) and Lloyd (10/10 Ba.48, 20/20 Ba.248 and 1/70 Ba.348).

The Aviatik D.I was skilfully designed and adapted for series manufacture. When it made its appearance at the end of 1916, it was at the same level as Western fighters, but it was soon shown that it was not good enough to keep pace in wartime conditions. Its weakest feature was the Austro-Daimler engine. Cooling problems were partially resolved by removing the engine nacelles, but the engine's low power of 185 or 200 mhp remained a permanent handicap. The problem was somewhat alleviated in 1918 when the excellent Austro-Daimler 225 mhp engine appeared, but for Berg it was too late, since it

Ex-LFT Aviatik (Berg) D.I at Ljubljana during the second half of 1919, in front of a hangar with a group of South Slavic aviators still wearing Austro-Hungarian uniforms. During their first years of service, D.I Berg fighters carried one of the temporary markings of the new country, which consisted of RAF type roundels (outwards to inwards Blue, White, Red). The roundel was placed on the wings and the vertical stabilizer. Note roundel is applied under the lower wing outboard of wing struts. (via Aleksandar Ognjević)



Roundels on tails of captured LFT aircraft, Ljubljana, September 1919 (right to left): Phönix C.I 121.68, Albatros D.III (Oef) and Aviatik D.I 92.53 (via Šime Oštric)



was displaced in the meantime by the better Albatros D.III Ba.153 (Oef) fighter. Due to the slow delivery of the said engines, a large number of aircraft constructed in some of the last series were delivered without engines and in accordance with LFT practice required engine installation in field conditions.

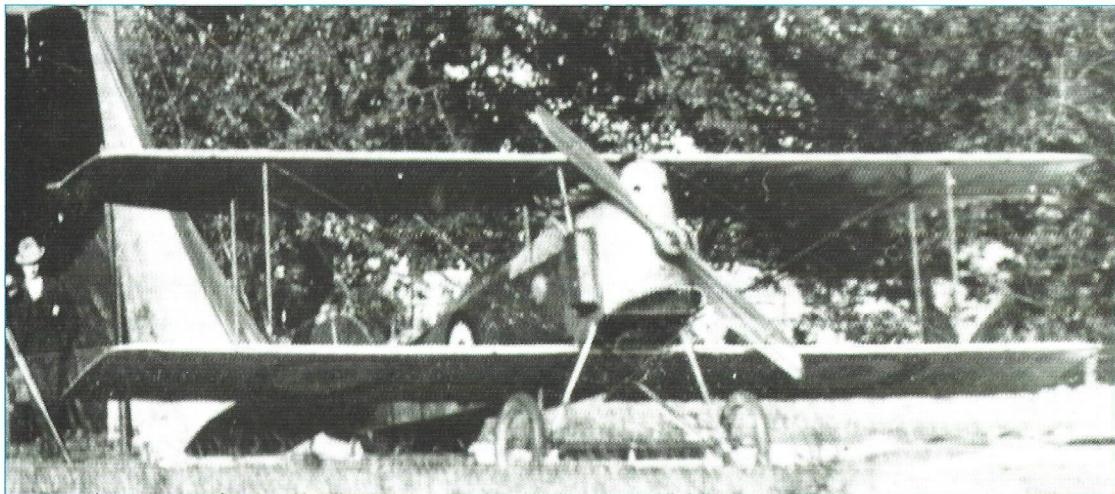
## Under the flag of the Kingdom of SHS

At the dawn of 31 October 1918 a combined *Escadrille* with 12 aircraft under the command of Stjepan Burazović, CO of *Flik* 35D, flew from Motta di Livenza to Ajdovščina airfield. On 1 November it transferred to Kamnik, and on 2 November to the recently established Ljubljana airfield. During the transfer a total of five aircraft were lost. These men who escaped from LFT were of South Slavic heritage and belonged to Command of Air Group from the Austro-Hungarian VII Corps, which consisted of three *Fliks* (*Fliegerkompanie* – Flying Company): *Flik* 5F (long range reconnaissance), *Flik* 35D (divisional) and *Flik* 61J (fighter). From the 12 *Escadrille* aircraft, three were Aviatik D.I (MAG) Ba.92 fighters (92.55, 92.56, 92.59, all from *Flik* 61J) and all managed to reach Ljubljana. Por Burazović had already given the order at Ajdovščina that the aircraft receive bands with Yugoslav colours applied.

This photo was taken in the summer of 1919 at Koprivnica. Three different aircraft from the temporarily-formed Aero Detachment Koprivnica are visible. From left to right: Ufag (Ph) C.I 123.13, Albatros D.III (Oef) 253.163 and Aviatik Berg D.I 238.53  
(Robert Čopek)

This Aviatik D.I was one of the most numerous types captured by the Serbian Army. Apart from serviceable aircraft, many incomplete, unserviceable and damaged machines were also present. On the list of captured aircraft from 1918-1919 there were a total of 43 Aviatik D.I fighters in six different versions (11 Ba.38, five Ba.138, 14 Ba.238, four Ba.284, one Ba.115 and eight Ba.92), which were captured in the western parts of the new country, the Kingdom of SHS. Some of these machines were completely new, lacking engines, wings and equipment and some were unserviceable. According to the audit from 24 May 1919, in Maribor there were four fully operational Ba.92s (92.22, 92.55, 92.56, 92.59) and one





Enlarged view of D.I 238.53 at Koprivnica clearly shows RAF style roundels in six positions. (Robert Čopek via Predrag Miladinović)

(92.53) undergoing repairs. The same document shows the situation at Ljubljana: five Ba.238s (which could easily be repaired) and a total of 30 D.I machines without engines (10 Ba.38, three Ba.138, 12 Ba.238, one Ba.115 and four Ba.284). Two machines, 92.18 and 92.54, were intended for repairs. As a result, only 19 aircraft were serviceable or were able to be repaired. From these 19, one was a Ba.38 (38.53), five Ba.138s, four Ba.238s, one Ba.284 and eight Ba.92 series. It is unknown if the sole example of the sixth series, Ba.115, was used at all.

During the war with Austria, five aircraft (92.53, 92.55, 92.56, 92.57, 92.59) from the Ljubljana unit were used for combat flights between February and June 1919 and one (92.53) was periodically used for liaison flights from Maribor. The Unit in Ljubljana, formed at the beginning of November 1918 by the National Council, also known by the Slovenians as "Ljubljanska stotnija" (Ljubljana Escadrille), received the official title Aeroplane Section of 4.AE of Air Force of KSHS. It was disbanded on 1 September 1919 and the aircraft were transferred to the ranks of Zagreb-based 4.AE. The machine 238.53 from this unit participated in combat, while 38.33 from the Aeroplane Section in Maribor flew during the first half of 1919 as a liaison aircraft. The majority of Ba.92 aircraft still flew in 1920 within 4.AE which was reformed in AE of 4.AO in March 1921. In July 1923 there were at least eight Berg aircraft in Ljubljana, the majority of which were Ba.92s (of which one was 92.18).

As a result of the Hungarian revolution, which lasted between March and August 1919, the aircraft and men from Zagreb-based 4.AE were sent to Koprivnica on 11 May 1919 as a new unit, a Detachment of 4.AE. One of the aircraft which flew in this unit was Aviatik D.I 238.53. The unit was disbanded in mid August.

Former LFT combat *Fliks* which retreated from Albania were based at Mostar airfield in addition to the training unit located there. There were 45 aircraft of various types in varying conditions on strength (of which 17 were from the Mostar unit). Amongst others were 15 Aviatik D.I Bergs (including unusable ones), and all were listed as unserviceable. Most were D.I Ba.92s, a total of 11: 92.10, 92.14, 92.15, 92.19, 92.32, 92.35, 92.39, 92.41, 92.42 (without the engine and machine guns), 92.27 and 92.38 (both without machine guns). The remaining four D.IIs were: 238.33, 238.56, 238.110 (all without engines and the last two also without machine guns) and 284.14. Many of the fighters had broken wings or fuselages or were missing magnetos or other parts. These aircraft were collected, disassembled and stored at the beginning of 1919 at Jasenica airfield by Mostar. Some of them, such as 284.14, were repaired. These aircraft belonged to the former *Flik 13J* and maybe also to fighter detachments of *Flik 6P* and *Flik 64P*. With the orders of *Odjel za narodnu obranu* (National Defense Department) from Zagreb, on 5 November 1918 *Avijatička eskadrila Jasenica-Mostar* (Aviation Escadrille) was formed. On 27 June 1919 this unit was reformed into 2.AE Detachment (in accordance with the KSHS Army formation).

Apart from the already mentioned aircraft, V KSHS had at least two more aircraft, one each from the Ba.38 and Ba.92 series (92.26 at Sarajevo), which were captured in other parts of the country, bringing the number of Aviatik D.IIs which served in V KSHS to a minimum of

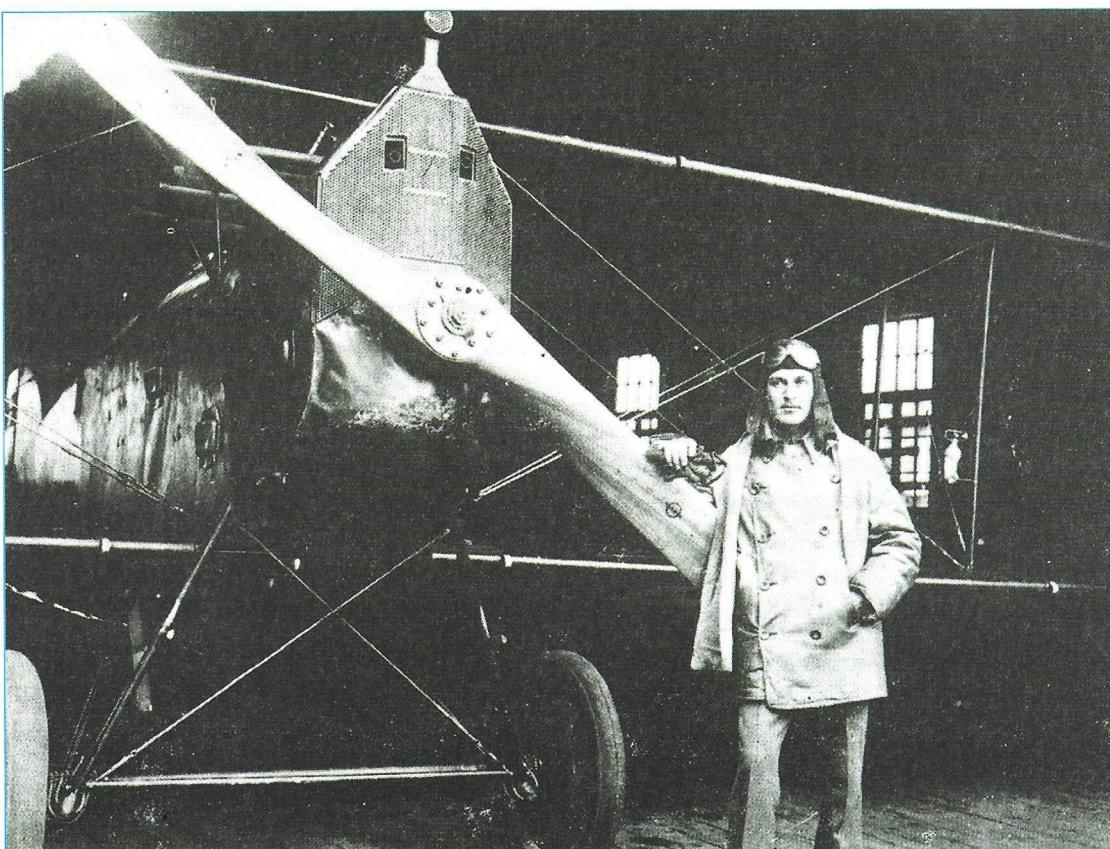
Pilot in Aviatik D.I 38.54 at Ljubljana airfield during June 1919. Note the camouflage demarcation pattern, as well as a White stripe along the fuselage, added by Ljubljana Escadrille personnel. (Šime Oštric)



Aviatik D.I 92.26 at Rajlovac airfield near Sarajevo in 1919, still carrying the original camouflage scheme from the former owner, Austro-Hungarian LFT. The rudder is entirely painted in the colours of the Serbian flag. Note the two parallel bands on the fuselage which remained from the LFT Fighter Section of Flik 6P which was disbanded at Mostar airfield during the last days of the Great War. (Aleksa Marinović via Milan Micevski)



Aviatik Berg D.I Ba.92 resting in the hangar at Ljubljana airfield in 1919, with pilot desetnik (kpl) Anton Majer in the front. Note the RAF style roundel under the port wing. (Gustav Ajdič via Čedomir Janič)



22, although this number was likely somewhat greater. In total 60 Aviatik D.Is were captured in different conditions and about two thirds were never used.

It is known that one Ba.38 (38.34) was destroyed in an accident at the Novi Sad airfield on 27 May 1925.

In the period immediately after World War I, when the French Spad equipped the V KSJS fighter *escadrilles* and Albatros D.III (Oef) fighter detachments within the reconnaissance *escadrilles*, single-seaters such as the Aviatik D.I Berg and Phönix D.I/D.II were used only for training. Berg fighters were used at the Pilot School at Novi Sad until the mid 1920s for basic aerobatic training. In the later period, when new Dewoitine D.1 C1 fighters replaced Spads, which were transferred to the reconnaissance *escadrille* detachments, the Albatros started to be used for training while Berg and Phönix aircraft became “rare birds”. Aviatik D.I service lasted until the mid 1920s. The last records of the Aviatik D.I in VV are found in an album belonging to the Aviation Museum in Belgrade, in a photograph taken during October 1931 at a hangar in Mostar where in the corner a fuselage belonging to this type of an aircraft is visible.

Aviatik D.I fighters in V KSJS service were equipped with water-cooled six-cylinder direct-drive Austro-Daimler AD 6 in-line engines with different power ratings, depending on the version, which were designated with Ba (*Bauart*) numbers. AD 6 Ba 17.000 (in LFT jargon Dm 160) was rated 160 mhp at



Pilots and ground personnel posing in front of Aviatik D.I 38.53 at Ljubljana. Original LFT data inscriptions can be seen on the port side of the fuselage nose. Note Phönix D.II in the background. (Šime Oštrić via Ognjan Petrović)



Pilot nar Ernest Turko in front of Ba.92 fighter at Ljubljana. Note the French style roundels applied in different positions, outboard of the wing struts and standard state flag over the entire rudder. (Šime Oštrić via Ognjan Petrović)



V KSHS ground personnel pictured in front of Aviatik D.I (MAG) Ba.92. Note the overall Light Grey camouflage and "Kosovo cross" under the port lower wing. (Miloš Milosavljević)



*Two shots of D.I 3834 remnants after nv IIIk Ga-brijel Hauptman survived an accident on 27 May 1925.*

*Note the Light Blue outlined White cross in the national insignia, according to the style of the early twenties.*

*(Šime Oštrić via Ognjan Petrović)*

## Camouflage and Markings

### Type designations

In accordance with the LFT military aircraft marking system, engineer Berg's fighter received the standardized designation Aviatik D.I, which meant that it was the first D class type manufactured by the Aviatik factory. The licence-built aircraft from other Austro-Hungarian factories carried an identical designation, with a shortened factory name in brackets at the end (MAG, WKF, Th, Lo).

In V KSHS jargon the Aviatik D.I was known simply as Berg and, according to the established practice, certain versions received designations in accordance with the engine power. Three classified versions existed: Berg-160 KS (Ba.238 and Ba.284), Berg-185 KS (Ba.38), Berg-200 KS (Ba.138 and Ba.92).

### Serial numbers

The original LFT serial numbers were written in Black on the fuselage sides. Each series (*Bauart*) received series numbers in accordance with the special system. The serial number consisted of two parts, with a full stop between the two. The first part defined the factory, type number and version and the second the individual aircraft number, which started at 01.

After the introduction of standard V KSHS markings in 1924, the same serial numbers were written without full stop on new templates with French font across the White band of the rudder-applied national flag.

### Camouflage schemes

In the first few years after the Great War, D.I Berg fighters, similar to other captured aircraft, retained the original camouflage schemes. Multiple colour variations existed depending on the series and the manufacturer. Some series had fuselages painted in Dark Grey mottles across varnished plywood. Some

other series had the fuselages painted in a special camouflage which consisted of oblique surfaces with grouped hexagons in two colours, in such a way that the edges of those surfaces resembled steps. The lower surfaces were in natural varnish, while the upper surfaces were also painted in the “stepped camouflage”, usually using Grey.

At the beginning of 1920s, a new overall Light Grey camouflage scheme was adopted for V KSHS fighter aircraft, which was similar to the camouflage on French Nieuports from 1917.

#### Markings and inscriptions

During the first service years D.I Bergs carried temporary markings of the new country, which consisted of RAF style roundels (outwards to inwards Blue/White/Red) or chevrons in national colours. The roundel was placed on the wings and the vertical stabilizer. Chevrons were placed in the six usual positions, on the wings and fuselage, while the vertical stabilizer had the national colour painted on, whose height spanned across two thirds of the rudder.

With the new all encompassing camouflage scheme, the new standardized national marking, the “Kosovo cross”, was used in four standard wing positions in addition to the state flag across the entire rudder.

#### Aircraft Characteristics common to all Aviatik (Berg) D.I versions (V KSHS Berg)

Quantity used:	(min.) 22
Crew:	1
Years of Service:	1919–1930
Armament:	Two synchronized 8 mm Schwarzlose/Steyr M.7/12 or M.7/16 machine guns

#### Aircraft Characteristics\* Aviatik D.I Ba.238 & Ba.284 (V KSHS Berg-160 KS)

Aviatik (Berg) D.I Ba.238	
Known Ba.Nr:	238.33, 238.35, 238.53, 238.56, 238.89, 238.110
Aviatik (Berg) D.I (WKF) Ba.284	
Known Ba.Nr:	284.14
Span:	8.0 m (26.2 ft)
Length:	6.9 m (22.5 ft)
Height:	2.9 m (9.6 ft)
Wing area:	20.3 m <sup>2</sup> (219 ft <sup>2</sup> )
Engine:	One 160 mhp Austro-Daimler AD 6 Ba.17.000 (Dm 160)
Empty weight:	658 kg (1,451 lb)
Loaded weight:	878 kg (1,936 lb)
Maximum speed:	192 km/h (119 mph) at sea level
Climb to 5000 m:	21 min 34 s

\*Data for Aviatik D.I Ba.238; weights for Aviatik D.I Ba.284 (WKF). Weights explanation: 878 kg = 630 kg aircraft + 28 kg water + 90 kg fuel + 80 kg pilot + 50 kg military load.

#### Aircraft Characteristics Aviatik D.I Ba.38 (V KSHS Berg-185 KS)

Known Ba.Nr:	38.33, 38.34, 38.53, 38.54, 38.63
Span:	8.0 m (26.2 ft)
Length:	6.9 m (22.5 ft)
Height:	2.5 m (8.3 ft)
Wing area:	21.6 m <sup>2</sup> (233 ft <sup>2</sup> )
Engine:	One 185 mhp Austro-Daimler AD 6 Ba.18.000 (Dm 185)
Empty weight:	606 kg (1,336 lb)
Loaded weight:	844 kg (1,861 lb)
Maximum speed:	195 km/h (121 mph) at sea level
Climb to 5000 m:	20 min 18 s
Endurance:	1 h 30 min

Aircraft Characteristics Aviatik D.I Ba.138 (V KSHS Berg-200 KS)

Known Ba.Nr:	138.06, 138.12, 138.1x (the last cipher 9, 8 or 6)
Span:	8.0 m (26.2 ft)
Length:	6.9 m (22.8 ft)
Height:	2.5 m (8.1 ft)
Wing area:	21.8 m <sup>2</sup> (235 ft <sup>2</sup> )
Engine:	One 200 mhp Austro-Daimler AD 6 Ba.19.000 (Dm 200)
Empty weight:	610 kg (1,345 lb)
Loaded weight:	852 kg (1,879 lb)
Maximum speed:	195 km/h (121 mph) at sea level
Service ceiling:	6,150 m (20,278 ft)
Climb to 6,000 m:	26 min 0 s

Aircraft Characteristics Aviatik D.I Ba.92 (MAG) (V KSHS Berg-200 KS)

Known Ba.Nr:	92.10, 92.15, 92.18, 92.19, 92.22, 92.26, 92.27, 92.32, 92.35, 92.38, 92.39, 92.41, 92.42, 92.53, 92.54, 92.55, 92.56, 92.57, 92.59
Span:	8.0 m (26.2 ft)
Length:	6.9 m (22.5 ft)
Height:	2.6 m (8.4 ft)
Wing area:	22.0 m <sup>2</sup> (237 ft <sup>2</sup> )
Engine:	One 200 mhp Austro-Daimler AD 6 Ba.19.000 (Dm 200)
Loaded weight:	888 kg (1,958 lb)
Maximum speed:	200 km/h (124 mph) at sea level
Climb to 5,000 m:	27 min 0 s

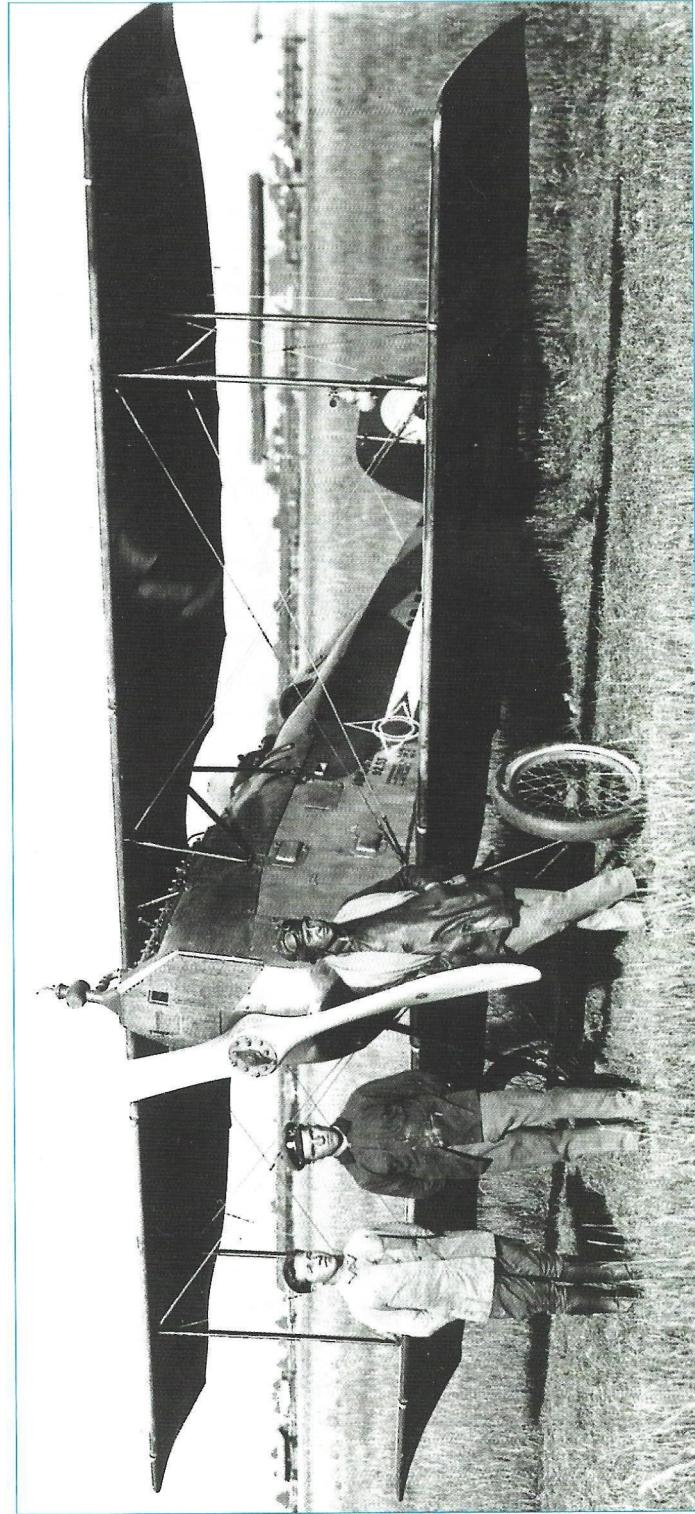
*Pilot ppor Dragoljub Pajević crashed Aviatik D.I 3863 at the end of Novi Sad airfield on 3 May 1925. (Šime Oštrić via Ognjan Petrović)*



Aviatik D.I (MAG) 92.53, Aero Detachment of 4.AE ("Ljubljana Escadrille"), Ljubljana airfield, late 1919.



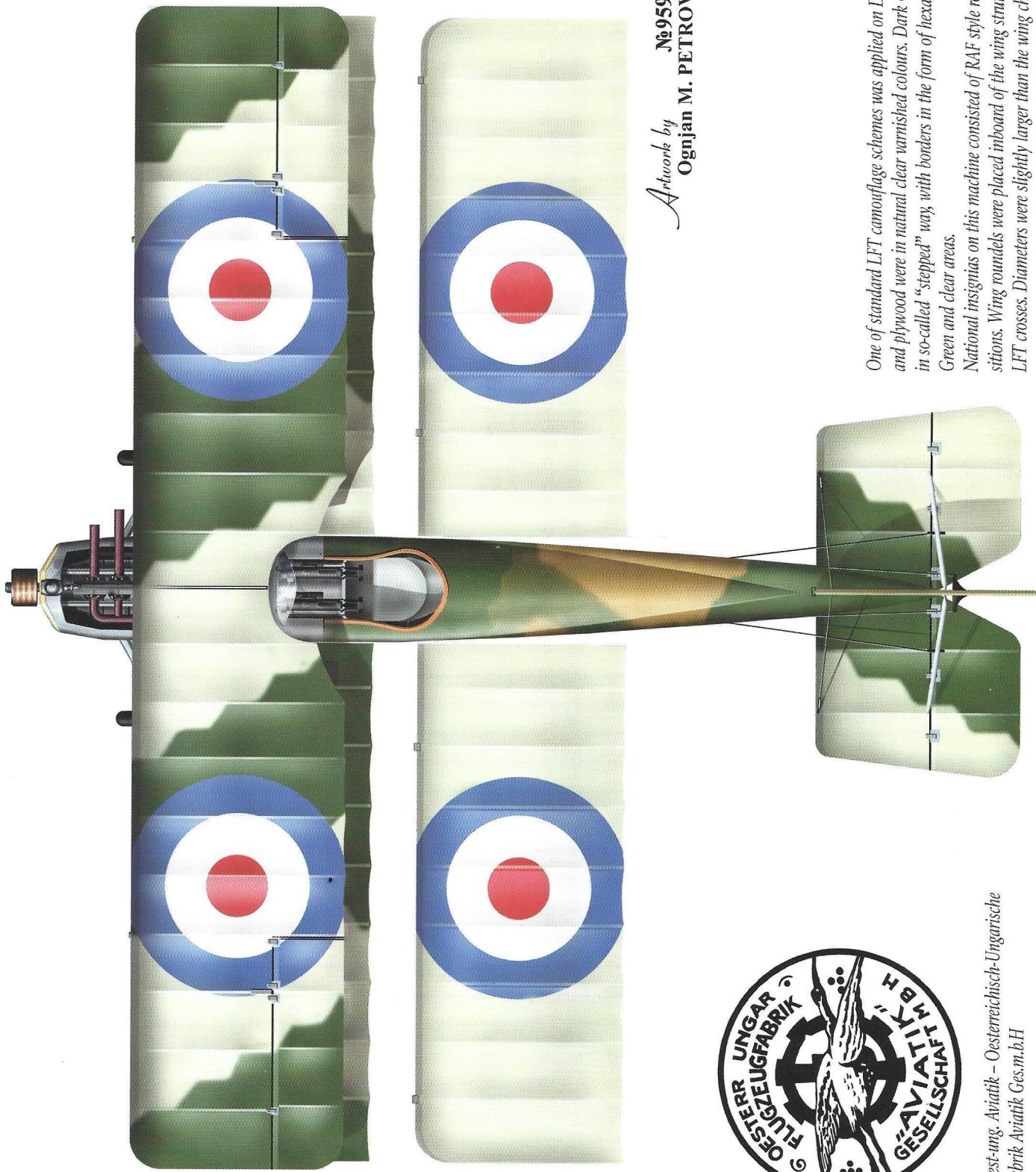
Well known shot of MAG-built D.I 92.53 at Ljubljana, 1919. Just below the cockpit is an interesting emblem, drawing of a circle inside of a four point star. A White strip, added by unit personnel, stretched from the star to the tail. Note that the upper engine cowling and wheel cover were removed. (Gordan Gulić family via Tomaž Perme and Marko Ličina)



# AvD(Mag)-Dm200 92.53

LEERGEWICHT	630 kg
NORM. BETRIEBSTOFF	118 >
BENZIN+OL. WASSER	140 >
NORM. NUTZLAST	

Original LFT aircraft data inscriptions (type, engine, s/n no, empty weight, fuel and water, payload, standard applied at the front of the port fuselage side.



One of standard LFT camouflage schemes was applied on D.I 92.53. All fabric surfaces and plywood were in natural clear varnished colours. Dark Green patches were applied in so-called "stepped" way, with borders in the form of hexagon sides between Dark Green and clear areas.

National insignia on this machine consisted of RAF style roundels in six standard positions. Wing roundels were placed inboard of the wing struts, precisely over the original LFT crosses. Diameters were slightly larger than the wing chord.

Logo of Oest-ung. Aviatik - Österreichisch-Ungarische Flugzeugfabrik Aviatik Ges.m.b.H

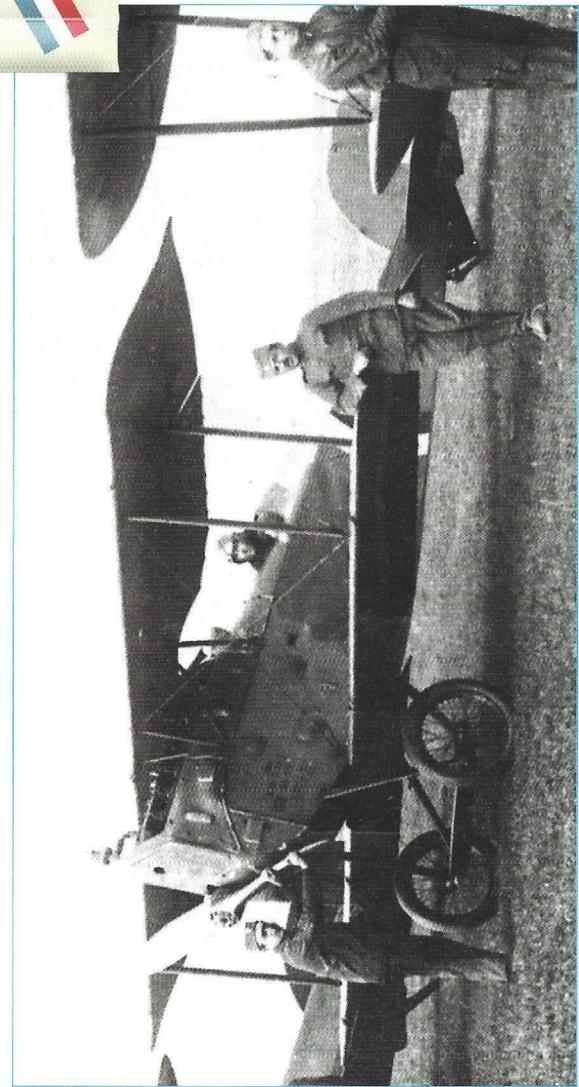
Aviatik D.I 38.53, Aero Detachment of 4.AE, V KSHS, Ljubljana airfield, 1920.



Aviatik (Berg) D.I 38.53 at Ljubljana at the very beginning of twenties with pilot sitting in the aircraft prior to engine start. (Gustav Ajdič via Čedomir Janič)



Above: This machine carries new chevron style markings placed in six positions, while the rudder had the national flag painted on about mid height.

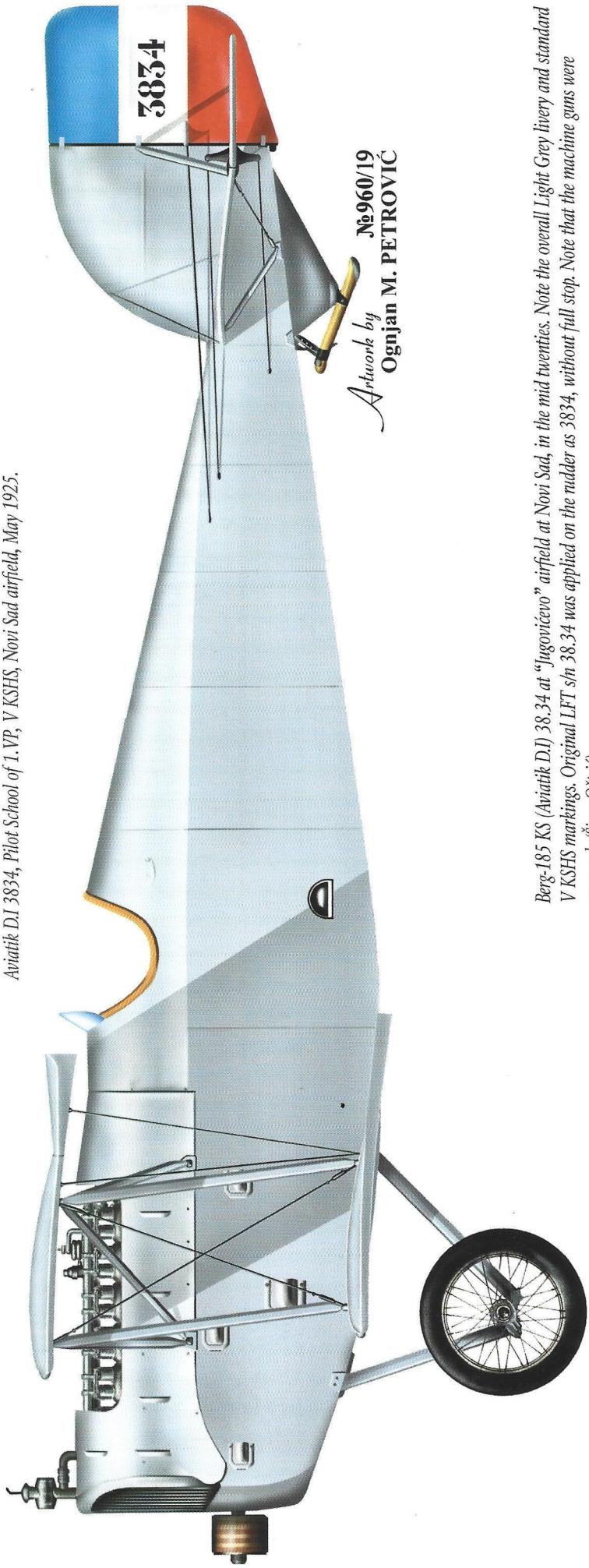


A<sub>v</sub>D.I - D.I 185  
**38.53**

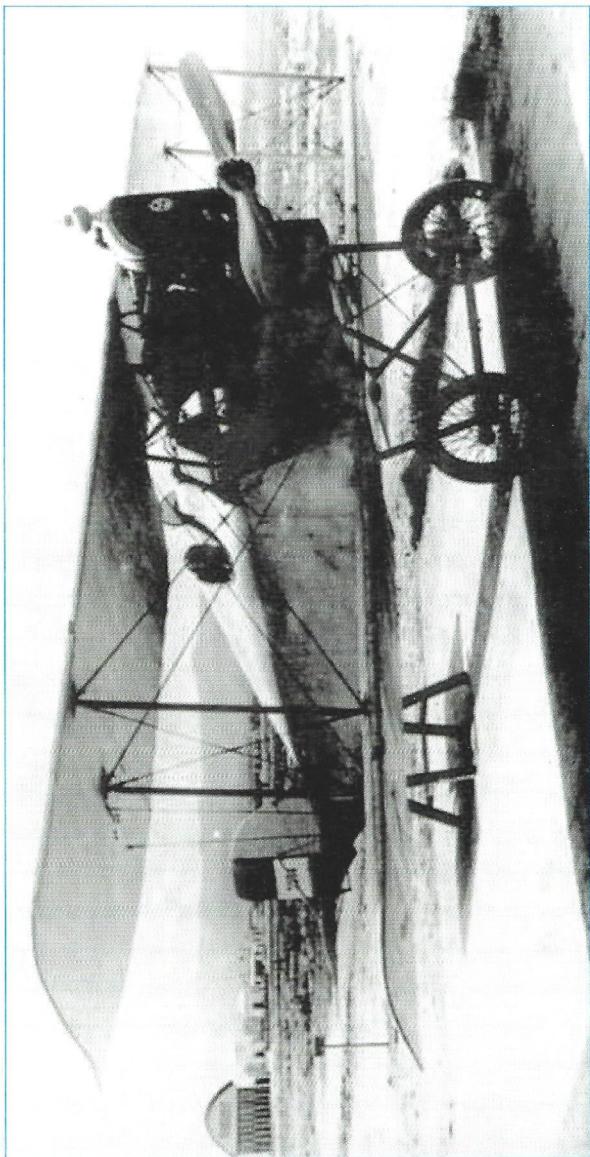
LEERGEWICHT 630 kg  
NORM.BETRIEBSTOFF 118 >  
BENZIN-ÖL-WASSER 140 >  
NORM.NUTZLAST 140 >

Original LFT aircraft data inscriptions.

Aviatik D.I 3834, Pilot School of 1.VP, V KSHS, Novi Sad airfield, May 1925.



Berg-185 KS Aviatik D.I 38.34 at "Jugovićev" airfield at Novi Sad, in the mid twenties. Note the overall Light Grey livery and standard V KSHS markings. Original LFT s/n 38.34 was applied on the nudder as 3834, without full stop. Note that the machine guns were removed. (Šime Oštrić)



Remnants of D.I 3834. There is a hand written note on the back side of the photo: "Aeroplane Berg. Crushed on 27 May 1925 near Novi Sad airfield. Pilot vodja (nv IIIk) Gabrijel Haupman lightly injured. (Aleksa Marinović family via Šime Oštrić)



New standardized camouflage scheme for V KSHS fighters, overall Light Grey applied on Aviatik D.I 38/53. Standard national insignia consisted of four "Kosovo crosses" (diameter 125 cm) in four wing positions and large state flag over the entire nacelle. Note the Light Blue border around the White cross.



Two types of logos used by Osterreichische Daimler-Motoren A.G.

# Ansaldo SVA 5 (V KSHS Ansaldo)

## Background

Two Italian engineers at *Direzione Tecnica dell'Aeronautica Militare* (DTAM – Military Aviation Technical Directory) of Turin, *Capitano* Umberto Savoia and *Capitano* Rodolfo Verduzio, designed an SV (*Savoia-Verduzio*) aircraft in mid 1916. For power plant they selected a new inline engine manufactured by SPA (*Societa Piemontese Automobili*) from Turin. The final development of the aircraft was completed by the young and capable engineer *Tenente* Celestino Rosatelli. The type, and later the entire developed family, were denoted SVA (*Savoia-Verduzio-Ansaldo*), which consisted of the first letters of the two original engineers and the factory. The prototype first took off on 19 March 1917 at Grosseto with test pilot *Sergente* Mario Stoppani at the controls. The first two series machines were tested on 1 July 1917. The aircraft showed poorer characteristics than the Italian Spad S.7 and the Hanriot HD.1 fighters, but was faster than both. As a result, early in 1918 it was decided to use the type as a long-distance strategic reconnaissance aircraft, since it did not have the manoeuvrability needed for a fighter aircraft, and operational flights began in March. The SVA 5 was the perfect machine for this role, having plenty of lift to carry a heavy fuel load, and more than enough speed to evade enemy fighters.

Numerous changes on the base project were performed which led to construction of multiple single and two-seat models, which were marked SVA 1 to SVA 10. From the first major production version, the SVA 4, a definitive production version, SVA 5, was developed. Ansaldo (*Giovanni Ansaldo & C°*) manufactured at its subsidiaries and at numerous other subcontractors by the end of the Great War a total of 1,248 SVA family biplanes. The majority of these aircraft were the single-seat SVA 5 fighters. Manufacturing continued until 1928, reaching a total of 2,000 machines, which were exported to 11 countries.

## Service in the Kingdom

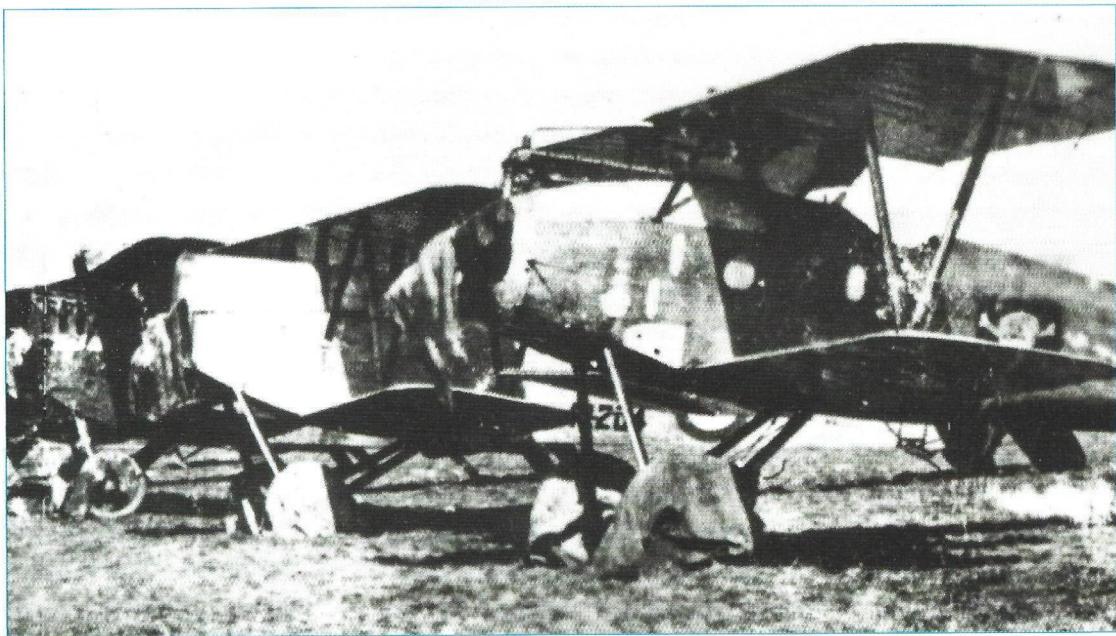
Flying from Udine to Pola, an Italian Air Force (*Aviazione Militare*) pilot lost orientation and force-landed on 10 October 1920 by Dolnja Vas village, four kilometers from the demarcation line in Zone A. The pilot was arrested and sent to Klagenfurt in Austria, this event being covered in Ljubljana newspapers on 18 October. As the aircraft, SVA 5 s/n 12204, was serviceable, it was immediately introduced into service with the Ljubljana-based Aeroplane Detachment of 4.AE which was situated at Zagreb airfield. This only Italian World War I aircraft in Yugoslav service was briefly used in the fighter role, but was lost in a flying accident soon after its capture.

The SVA 5 power plant was a water-cooled six-cylinder in-line direct-drive SPA 6a (or S.P.A. 6A) engine, which was rated at 220 mhp at 1,660 rpm and 234 mhp at 1,700 rpm. The aircraft was equipped with two forward-firing 7.69 mm Vickers machine guns and three 162 mm bombs. Gunsight was Chrétien type. Two cameras could be carried when used in the reconnaissance role. The aircraft could also be equipped with a radio set.

## Camouflage and Markings

### Type designations

Officially designation in Italian *Aviazione Militare* was SVA 5, while the type was named *Primo* (The First). In V KSHS service the type was simply known as Ansaldo.



Albatros D.III Oef 53.57 mod and Ansaldo SVA 5 s/n 12204 belonging to the Aeroplane Detachment of 4.AE in Ljubljana. SVA 5 was captured when its pilot lost orientation and landed by Dolnja Vas village. (Sime Oštric)

### Serial numbers

Aircraft of the SVA family in Italian service were assigned five-digit serial numbers, usually carried on the fuselage sides.

### Camouflage schemes

The Ansaldo SVA 5 (and other members of family) had a characteristic factory painting scheme, with the fuselage in stained and varnished plywood (lighter or darker Brown colour), Dull Metal cowlings, Brass radiator and Black or Grey struts. Aircraft s/n 12204 had the lighter shade of plywood. All fabric-covered surfaces were unpainted, which gave them an off-White or Yellowish shade. Large numbers of SVA aircraft had camouflaged upper surfaces, with Reddish Brown and Medium Green mottles over Yellow undercoating.

### Markings and inscriptions

At the time when it was captured by the Yugoslavs, SVA 5 carried standard post-war Italian national markings. Italian roundels (Red outer ring/White/Green) were applied at six positions, upper sides of the upper wings, undersides of the lower wings and two on the fuselage sides. Vertical stripes in Italian flag colours were applied over the entire rudder (Red on the leading edge).

The S.V.A. type name was applied in large Black letters on both fuselage sides (between cockpit and fuselage roundel), with model number (5) in superscript. Serial number was carried below that inscription.

V KSHS simply painted a Blue centre on the Italian roundel, thus becoming French style roundels with Yugoslav colours. Green on the rudder trailing edge was also painted over in Blue.

### Aircraft Characteristics Ansaldo SVA 5 (V KSHS Ansaldo)

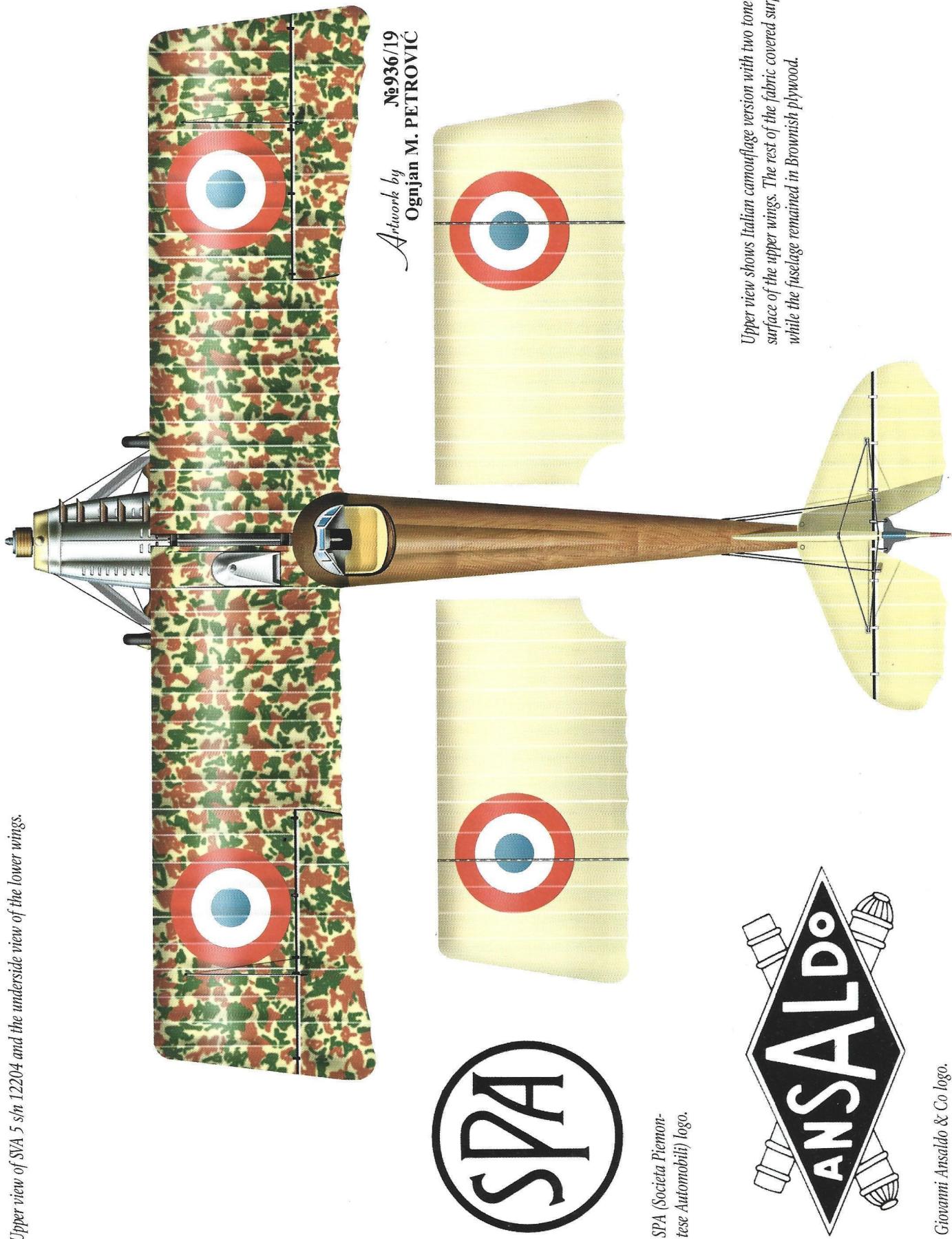
Quantity used:	1
Crew:	1
Years of Service:	1920-1921
Span:	9.1 m (29.9 ft)
Length:	8.1 m (26.6 ft)
Height:	2.7 m (8.7 ft)
Wing area:	24.2 m <sup>2</sup> (260 ft <sup>2</sup> )
Engine:	One 220 mhp Società Piemontese Automobili SPA 6a
Empty weight:	700 kg (1,543 lb)
Loaded weight:	1,050 kg (2,315 lb)
Maximum speed:	215 km/h (134 mph) at sea level
Service ceiling:	6,000 m (19,686 ft)
Climb to 5,000 m:	58 min
Endurance:	5 h
Armament:	Two synchronized 7.69 mm (.303 in) Vickers machine guns and up to 90 kg (200 lb) of bombs

Ansaldo SVA 5 s/n 12204, Aeroplane Detachment of 4.AE (4<sup>th</sup> Aeroplane Escadrille), V KSHS, Ljubljana airfield, 1920.



New Yugoslav insignias were introduced on this machine: roundels with Blue centre and tail stripes with Blue field on the trailing edge. Note a letter S which remained on the original Red tail strip, while the other two letters (V and A) were over painted with White and Red colours.

Right: Ansaldo SVA 5 s/n 12204 with aviators nar Ivan Ranor and kap Josip Kos, Detachment of 4.AE, 1920. (Janez J. Švajncer: Slovenska vojska 1918-1919, Ljubljana 1990)



# Bristol F.2b Fighter (V KSHS Bristol-Hispano)

## Background

*V KSHS ground personnel pictured in front of the Bristol F.2B, which had just arrived from the United Kingdom. Novi Sad airfield, 1923. Note the Dark Green camouflage and White outlined letter "G" on the rudder, from the UK civil registration G-EBFD.*

*(Marko Ličina via Predrag Miladinović)*

In the autumn of 1915 the need for an effective replacement for the B.E.2c and B.E.2d was foreseen. The R.F.C. (Royal Flying Corps) HQ in France issued a specification for a corps reconnaissance and artillery spotting aircraft, with particular emphasis on the ability to defend itself. As a result, Captain Frank Sowter Barnwell O.B.E., A.F.C., the leading designer of B&C (British and Colonial Aircraft Company) at Filton, began designing a replacement for the B.E. Types. His first project, designated the Bristol R.2A, was a two seat biplane powered by a 122 mhp Beardmore engine. The next iteration of the design, the R.2B, was powered by a 152 mhp Hispano-Suiza engine. Finally, when the 193 mhp Rolls-Royce Eagle became available, Barnwell completed the third design with an entirely revised airframe. This aircraft was equipped with a forward-firing Vickers machine gun as soon as the synchronizing mechanism became available. The new type was named Bristol F.2A and an order for two prototypes, s/nos A3303 and A3304, was placed along with one for 50 production aircraft A3305-3354. The first prototype with the Falcon engine flew on 9 September 1916 and the second one, with the Hispano-Suiza engine, followed on 25 October.

The 50 production F.2As were powered by Rolls-Royce Falcon I engine and their deliveries began just before Christmas of 1916. The first R.F.C. squadron to receive them was No 48. F.2As from 48 Sqn





did not cross the demarcation lines until 5 April 1917 when, following a battle with Albatros D.III's from *Jagdstaffel 11* led by Manfred von Richthofen, only two of six aircraft returned. The pilots who flew these Bristol machines disregarded this event and began using their aircraft more offensively, like fighters, leaving the observer to defend from the rear, which resulted in stunning results.

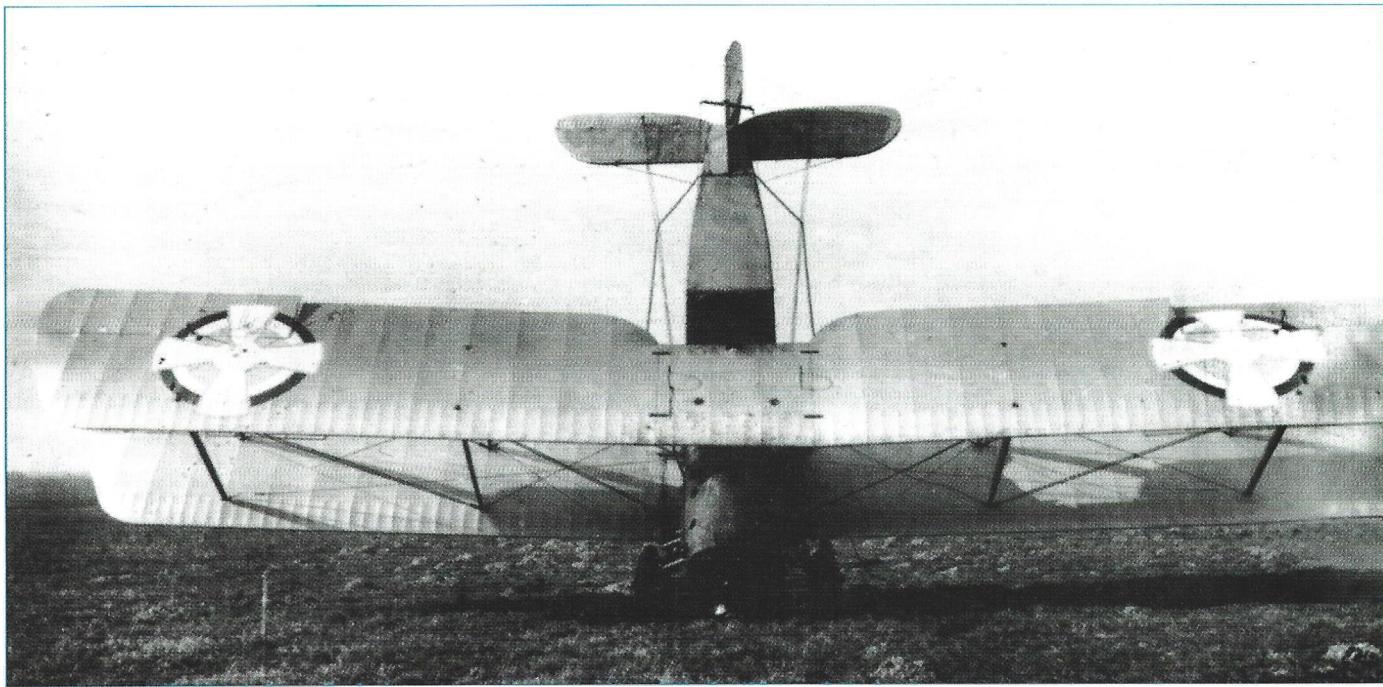
An order for 200 more Bristols, A7101-A7300, was placed in November, of which the first 150 had the Falcon I and the remaining the more powerful 224 mhp Falcon II engine. Due to the numerous changes implemented in production, a new designation, Bristol F.2B, was assigned, also adopting an unofficial name "Bristol Fighter". Subsequent aircraft were delivered with 279 mhp Falcon III engines and a follow-on order for 800 more was placed. The new fighter was fast, agile, manoeuvrable, robust and well armed. It enabled its pilots to fend off the attacking enemy fighters and shoot many of them down.

The number of production machines totalled 3,493 of 5,500 on order. The original engines were 193 and 279 mhp Falcon, 203 mhp Sunbeam Arab and 200 mhp and 300 mhp Hispano-Suiza. After the Great War the new RAF adopted the Bristol as the standard army co-operation aircraft, and it equipped squadrons in England, India, Palestine, Egypt and Turkey. In the years following the armistice, surplus Bristols were sold to foreign countries such as Belgium, China, Ireland, KSHS, Mexico, New Zealand, Norway, Soviet Union and Spain. RAF service ended in 1931.

*Mechanics from 1.VK's Aeroplane Workshop lined up in front of the F.2B, Novi Sad airfield, 1923. The machine was repainted in overall Light Grey according to the V KSHS rules for fighter camouflage, while national insignia were not yet applied. (Šime Oštric)*



*Curious onlookers inspecting the F.2B resting on its nose. (Šime Oštric)*



## Another shot of the F.2B after the accident. (Šime

Oštrić)

Due to the financial crisis before 1922, KSHS did not seriously consider rearming its land or air forces. In the summer of 1922, the head of the aviation department, General Milan S. Uzelac, travelled as the head of a commission across Europe, to study the state of other air forces and national industries. As an outcome of this trip, several pattern machines were ordered, of which one was a Bristol F.2B. This machine, c/n 3957 (RAF s/n E2354), was manufactured by B&C at Filton, as one of 500 Bristol F.2B Fighter aircraft (c/nos 3754-4253, RAF s/nos E2151-E2650) equipped mainly with Rolls-Royce Falcon engines. This series was ordered in early February 1918 and delivered by December of the same year. The Yugoslav example of Bristol F.2B was re-engined by the manufacturer (the Bristol Aeroplane Company from 1920) with a 300 mhp Hispano-Suiza engine and registered with the "Aircraft Disposal Company Ltd." and given a civil British registration, G-EBFD.

The trial flight in front of the V KSHS commission was conducted by British pilot Norman McMillan, who then flew the aircraft over to Novi Sad in March 1923. During this flight, the pilot encountered numerous engine problems, which resulted in several forced landings. As a result, the entire trip took 20 days.

Following the arrival at Novi Sad airfield, the aircraft was demonstrated in flight to V KSHS officers and HQ experts. It also flew alongside a Spad, piloted by *por* Leonid Bajdak, even simulating mock combat. A technical commission was formed to investigate all aspects of the newly arrived aircraft, and by the end of Easter of that year the decision was made to keep the aircraft in service. Within V KSHS service it was primarily used for demonstration flights and aerobatics. One such flight took place on 6 November 1923 when pilot Bajdak took off with the famous Serbian writer Miloš Crnjanski, who was impressed by both the aircraft's characteristics and the pilot's skills, publishing several articles in local newspaper describing this event. Another pilot who flew the Bristol F.2B was *kap* Janko Markičević, whose logbook lists flights with the type on 16 February, 14 March, 19 March and several in August and September 1925. The only known accident with the type took place with Bristol ending on its nose following a landing mishap by pilot *kap* *Ik* Stanko Brašić, with no apparent damage to the aircraft.

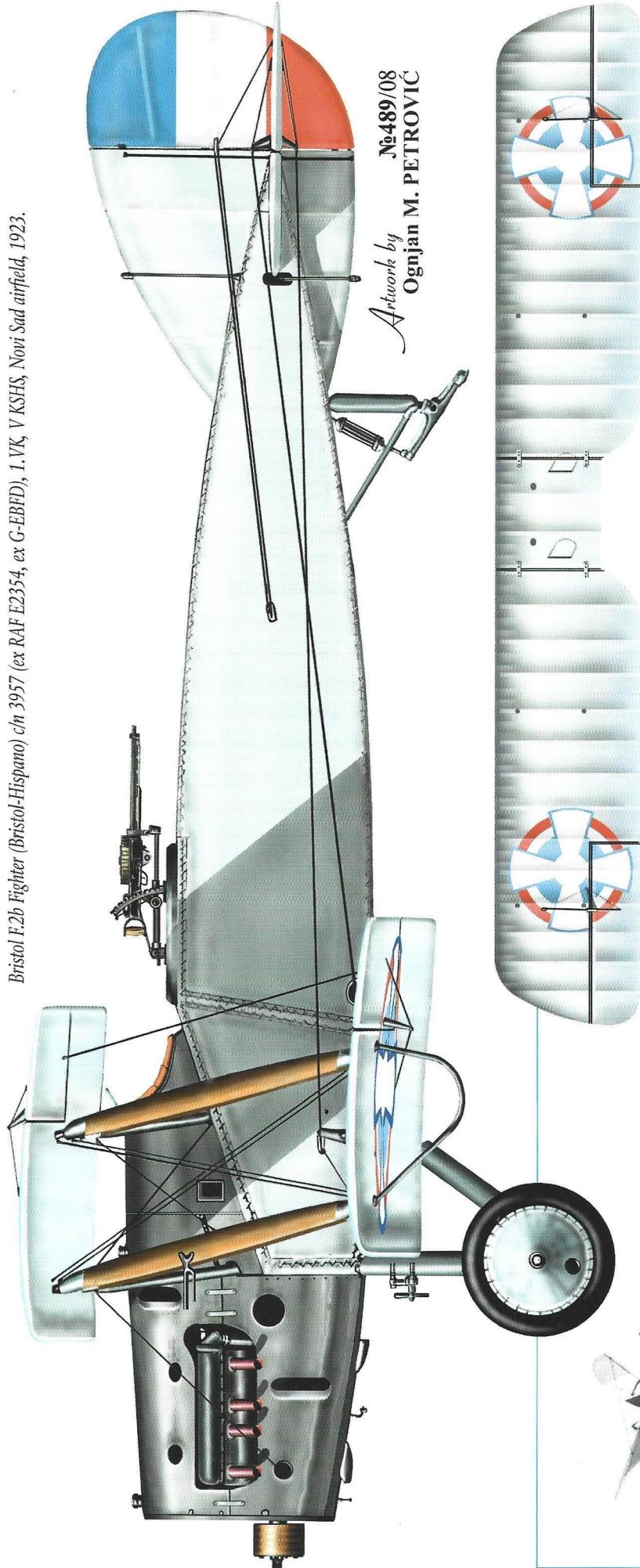
The Bristol F.2B remained in VV service at least until 1926, as the last mention of the machine appears in documents from that year. Its exact fate remains unknown.

## Camouflage and markings

### Type designations

The Bristol system of Type numbers was introduced and applied retrospectively by Frank Barnwell in 1924. The Yugoslav machine was an original F.2B from RAF stocks (Bristol Type 17) modified with the Hispano engine, therefore its designation in accordance with the V KSHS jargon was Bristol-Hispano or Bristol 300 KS.

Bristol F.2b Fighter (Bristol-Hispano) ch 3957 (ex RAF E2354, ex G-EBFD), 1.VK, VKSHS, Novi Sad airfield, 1923.

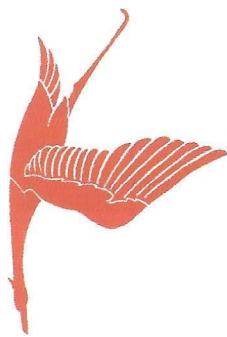


Upper surface of the upper wing shows 150 cm diameter "Kosovo cross" positions. Under surface of the lower wing shows the same insignia at the same positions. Note a White cross outlined in Light Blue.

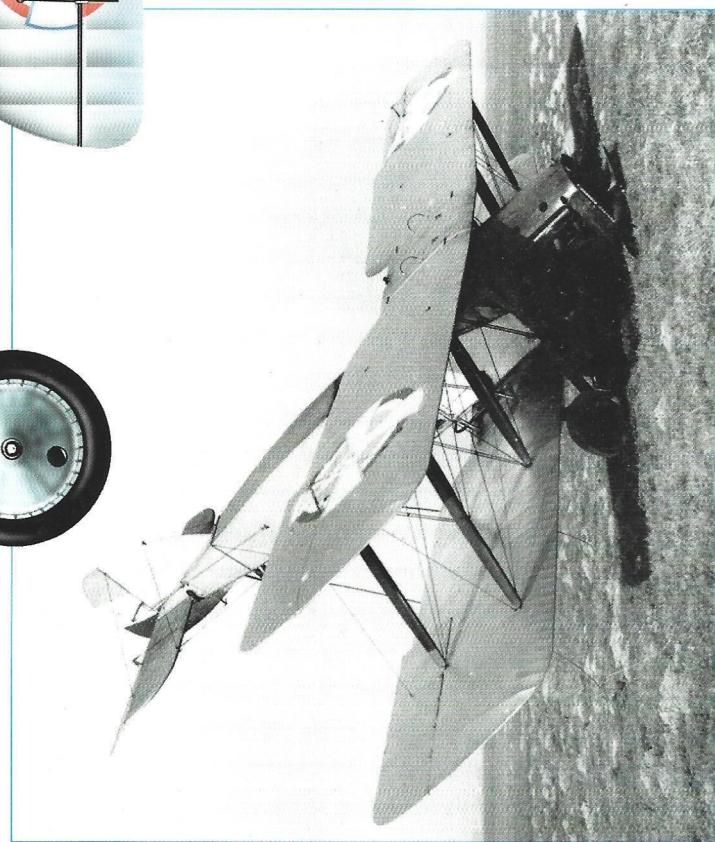
Logo of The Bristol  
Airplane Company.

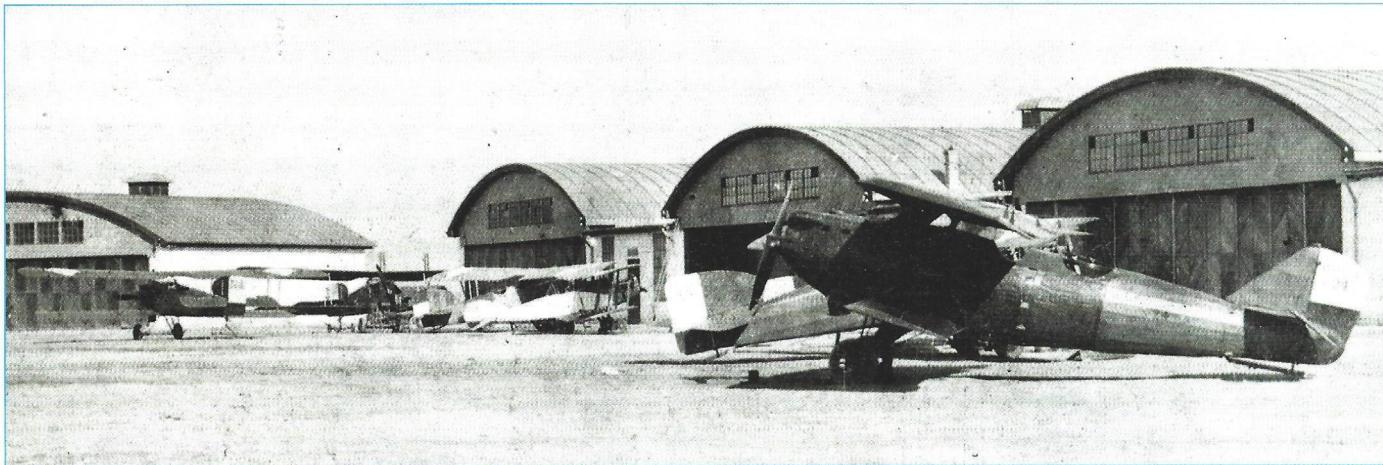
"Bristol"

Hispano-Suiza logo.



Bristol-Hispano after an accident by pilot kap lk  
Stanko Bratić at Novi Sad airfield on an unknown  
date, probably 1924. (Milan Micevski)





Very interesting scene at

Novi Sad airfield shows  
aircraft from 1.VP (right  
to left): Breguet Bre 19A2

Nº24, Breguet Bre 14A2  
Nº2142, Bristol F.2b Fighter  
and another three Bre 14  
machines. According to the  
Bre 19A2, this photograph  
was taken in 1926 or some-  
what later. (Robert Čopek via  
Predrag Miladinović)

### Serial Numbers

The aircraft had c/n 3957 and carried the RAF serial E2354 while in service in the UK. After it was sold to a private company, it received the civil registration G-EBFD, which was applied on the vertical stabilizer and the fuselage. In V KSHS service, it did not receive new serial numbers.

Nº24, Breguet Bre 14A2

### Camouflage Schemes

On arrival the aircraft was painted in overall Dark Green camouflage with White outlined letter "G" on the rudder, from the UK civil registration G-EBFD. It was later repainted entirely in Silvery Light Grey, similar to other fighters in V KSHS service in the early 1920s.

### Markings and inscriptions

During delivery, the machine carried the British civil registration and no national insignia. Following delivery, it received standard 150 cm diameter "Kosovo cross" insignia above and below both wings. A national tri-colour flag was applied across the entire rudder. The machine carried no inscriptions, according to the available photographs.

### Aircraft Characteristics Bristol F.2b Fighter (V KSHS Bristol-Hispano)

Quantity used:	1
Crew:	2
Years of Service:	1923-1926 (estimate)
Span:	12.0 m (39.4 ft)
Length:	7.5 m (24.6 ft)
Height:	2.9 m (9.5 ft)
Wing area:	37.7 m <sup>2</sup> (406 ft <sup>2</sup> )
Engine:	One 300 mhp Hispano-Suiza 8Fb
Empty weight:	938 kg (2,067 lb)
Loaded weight:	1,370 kg (3,020 lb)
Maximum speed:	172 km/h (107 mph) at 3,000 m (10,000 ft)
Armament:	One fixed forward firing synchronized 7.69 mm Vickers machine gun and one 7.69 mm Lewis machine gun on a Scarff No.2 ring

# Dewoitine D.1 C1 (VV Dewoitine-Hispano)

## Background

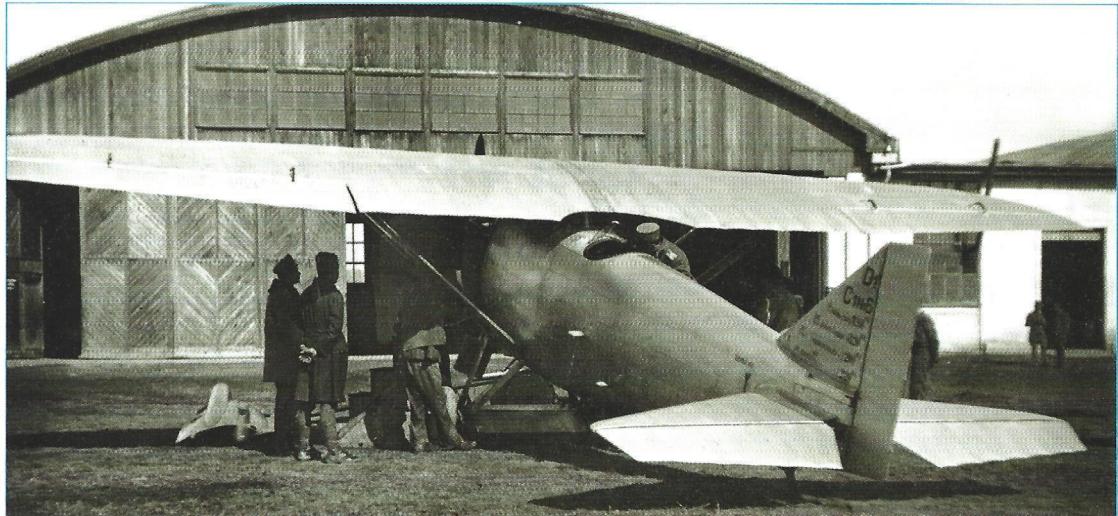
In October 1920 French engineer Emile Dewoitine founded the CAED company (*Constructions Aéronautiques Émile Dewoitine*) in Toulouse. Towards the end of the year, on the basis of a concept from 1919, he completed a project for a parasol fighter, internally designated as Dewoitine C1 300 ch Hispano Suiza. The project was accepted under the designation D.1 and prototype construction began at the end of 1921. Some of the work was done at the *Atelier Pasteur* workshop in Toulouse, since CAED lacked the technical capability for metal fabrication. The first flight took place on 18 November 1922 and, following the official trials and certain objections, Dewoitine modified the prototype twice. Modifications were marked as D.1bis and D.1ter and the second was adopted in 1924 for series production. During 1923-1924, a total of 10 pre-series (six D.1bis and four D.1ter standard) and two series aircraft were produced. The series aircraft had a shorter wingspan with wings raised on the centre section front and rear struts, which differed from the D.1bis which had longer span wings which rested directly on the fuselage.

Five foreign countries purchased pre-series aircraft for evaluation: one each by Czechoslovakia, Japan, Italy and KSHS and two by Switzerland. According to the contract with CAED from March 1924, the SECM-Amiot (*Société d'Emboutissage et de Constructions Mécaniques*) factory from Colombes (Seine) began series production in 1925 and completed 110 D.1 C1 fighters to D.1ter standard. From December 1924, the Dewoitine factory changed its name to CAD (*Constructions Aéronautiques Dewoitine*) and the first flight by a production aircraft took place on 18 January 1925. These machines were purchased by KSHS and the French Naval Air Service (*Aéronavale*). Apart from them, the Italian factory *Aeronautica Ansaldo SA* (from 1926 incorporated into the Fiat concern) produced 120 licensed (and modified) derivatives designated as AC2 (*Ansaldo Caccia 2*), which resulted in Italy becoming the most numerous user of Dewoitine's first fighter.

Officers and pilots from 1.VP in front of the just arrived D.1bis №06, Novi Sad, 1924. In the first row, standing from left to right are (first) kap Miodrag Tomić, (fourth) Marcel Doret, (fifth) general Radisav Stanojlović, (seventh) ppuk Jovan Jugović. This machine had no insignias. (Miodrag Tomić via authors)



D.1bis in November 1924, still without national insignias. Note French factory inscriptions on the vertical stabilizer. (Milan Micevski)



## D.1bis testing and evaluation

In December 1923, the air attaché in Paris, *maj* engineer Dušan M. Radović, tested a D.1 and gave it a favourable recommendation. On 19 January 1924 CAED factory pilot Marcel Doret and mechanic Aroles came to KSHS with the pre-series D.1bis №04. The presentation and trials were witnessed by the designer and the owner of the company, engineer Émile Dewoitine (ex soldier of French *Escadrille* MFS.99 in Serbia during 1915). Based on the test results at Novi Sad, held between February and April 1924, in the same year the D.1 was adopted as the new fighter type in V KSHS service. The magazine "Naša krila" (Our Wings) №1 from June 1924 published an article concerning the adoption of the D.1 as a V KSHS fighter type. Trials by the pattern aircraft were described as follows: "Test flights were conducted at Novi Sad and yielded most favourable results. In vertical dives the aircraft attained a high speed; when recovering from a dive it would do so almost vertically, in a single go of 200 m. During landing it flies at 80 km/h."

The second pattern aircraft, pre-series D.1bis №06, was delivered to V KSHS 1.VK (Ваздухопловна команда – Aviation Command) in the middle of 1924 and on 2 August it took part at the Saint Ilija (St. Elijah) Day celebration at Novi Sad. In the logbook belonging to pilot Janko Markićević, a flight was logged on 28 August, flying the same aircraft in 1.VP Pilot School. Next August №6 flew in the celebration at Novi Sad and the magazine "Naša krila" from September 1925 described it with the words "light and elegant". It was most frequently flown by *maj* Teodor Uzelac. It was the only Yugoslav D.1bis, which was later returned to the factory.

## D.1 C1 deliveries and service

From the funds allocated in a 300 million French francs credit for the purchase of weapons, which was approved on 17 December 1923 by the French senate, V KSHS purchased 206 aircraft of which 150 were Breguet 19A2/B2 reconnaissance/bombers, six CAMS 30E flying boats and 50 Dewoitine fighters (44 D.1 C1s and six D.9 C1s). Literature sources often list the wrong information, stating that KSHS purchased 79 D.1s, that is 80 fighters including the first pattern aircraft №6. The explanation lies in the fact that the French military commission (which in accordance to the contract was obliged to inspect all aircraft prior to delivery to Novi Sad), refused to accept 30 D.1s as they were sub-standard. As a result, from the total of 80 machines on order, only 44 D.1s were delivered, plus six D.9s somewhat later. There is other information that after the successful testing of the pre-series №4 at Novi Sad, the KSHS Government, with the approval of the French War Ministry, ordered 60 aircraft, which the French temporarily marked as D.1 "SHS". In any case, 44 series D.1 C1 aircraft was defined in August 1925 as the initial quantity from contract №6/4, which was fulfilled by SECM in March 1924. The reduction of the number from 60 to 44 aircraft for KSHS coincided with the increase in number (from 30 to 40) of aircraft on order for the French Naval Aviation (*l'Aéronavale*). The delivery of 44 aircraft was completed during 1926, following some factory modifications and strengthening of the airframe in accordance with the *l'Aéronavale* specifications. The modification was required by the French technical service STAé. The assembly was conducted at Novi Sad with the assistance of one detachment from SECM. A factory mechanic, Maurice Saint-Ellier, remained in the Kingdom until 1928 to train Yugoslav personnel.

Two air groups were formed in the spring of 1927 at Novi Sad airfield, both within 1.VP and both were armed with the new D.1 fighters. The first group, 121.VG, incorporated 251.E (ex 5.E) and 252.E (ex 10.E), while second, 125. VG incorporated 271.E and 272.E, which were both newly formed. On 25



*Magnificent photo of D.1 C1 №06 fighter, taken shortly after national markings were applied, "Sajlovo" airfield, Novi Sad, (probably) 1924. Observer kap I kl Ljuba Trpković is sitting in the cockpit, while hangar in the early stage of construction is seen in the background. This pattern aircraft delivered to the Air Force in mid 1924, was the sole Yugoslav D.1bis type. Later it was returned to the factory. (Aleksandar Ognjević)*



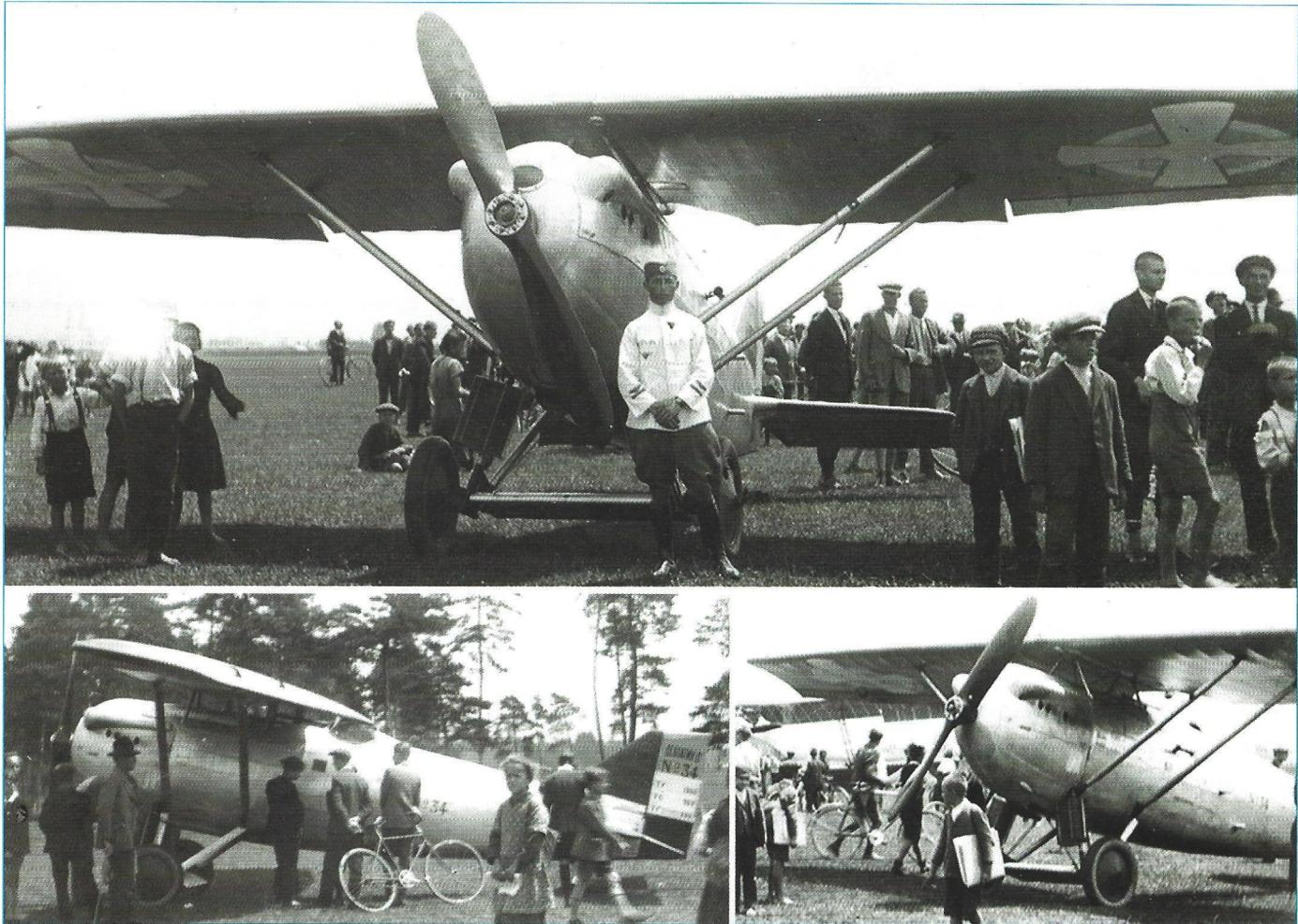
*Three-quarter view of D.1bis №06 with engine cowlings removed. (Čedomir Janić)*



*A rare in-flight shot of D.1bis over the Danube (Robert Čopek)*



*Front view of the newly arrived Dewoitine D.1 C1 fighter in service within 1.VP at Novi Sad, 1926. (Aviation Museum – Belgrade)*



Three shots of D.1 C1 №34 exhibited at a meeting at Ljubljana, 26 June 1927.  
(Marko Malec)

March 1927, 125.VG under the command of *maj* Miodrag P. Tomić, relocated with its 25 Dewoitine D.1 and D.9 fighters from Novi Sad to the newly opened airfield at Zemun, which was officially known as "Aerodrom Beograd" (Belgrade Aerodrome). A new 6.VP was formed from this group on 1 April 1928. In May 1929 at Zemun airfield, 127.VG (281.E and 282.E) was formed within 6.VP and was armed with D.1 fighters and as of 1931 it used Avia BH-33E fighters in parallel.

As the newest and most modern fighter in V KSHS, the D.1 was often showcased at different air meets and shows throughout the Kingdom. According to the pilots it was "fine and suitable for aerobatics". From 1926, each 6 September for Crown Prince Peter's birthday, the annual air race competitions for the King's Trophy was organized in three classes: combat two-seaters, training aircraft and fighter aircraft. Only standard aircraft types in VV service were used, with regular equipment and armament. The right to participate was given to all active and reserve pilot officers, NCOs and officer-observers. Fighter aircraft did not partake in the first race in 1926. As a standard aircraft type, the D.1 participated in the King's Trophy air races on 6 September 1927, 1928 and 1929 in the fighter category. At the race in 1927, the sole participant was the D.1 with seven aircraft, piloted by *nar* Pavle Glodić, *kap IIk* Mihovil Lukšić, *kap IIk* Gustav Koračin (2<sup>nd</sup> place), *nar* Vladimir Grgić, *nar* Milan Bjelanović, *kap I* Pavao Cenčić and *kap IIk* Vladimir Lorin (1<sup>st</sup> place).

At the races in 1928, five D.1s and one D.9 took part, with pilots *por* Stanislav Malin, *por* Siniša Nikolić, *nar* Franc Eger, *vt* manager Ernest Turko and *por* Zlatko Šintić (1<sup>st</sup> place) flying the D.1 and *kap IIk* Sergije Šebaljin (2<sup>nd</sup> place) flying the D.9. In 1929 a total of four D.1s and two D.9s took part. D.1s were flown by *ppor* Jovan Rapajić (1<sup>st</sup> place), *por* Vladimir Tihomirov (2<sup>nd</sup> place), *por* Nikola Nikolić and *nar* Alojz Kalšek. D.9s were flown by *por* Božidar Kostić and *kap IIk* Franja Rus. Due to engine malfunction *por* Nikolić crash landed in foggy conditions near Zenica, while *nar* Kalšek totally destroyed his D.1 №13 (with "White 6" applied on the vertical stabilizer) near Kakanj.

The Zmaj factory, responsible for repairs, received in 1929 the task of covering and varnishing the fabric on 20 D.1 and D.9 fighters from 6.VP. During 1929, Zmaj repaired four Dewoitine wing assemblies.

Despite certain deficiencies, the D.1 had a very modern metal structure. It was the first modern fighter type in KSHS service in the second half of the 1920s. It was powered by a V8 water-cooled Hispano-Suiza 8Fb engine (factory designation HS Type 42/8) with nominal rated power of 300 mhp at 1,850 rpm and maximum rating of 345 mhp at 2,100 rpm. As a fighter, the D.1 was armed with two Vickers machine guns with 800 rounds per gun. As a fighter trainer it was equipped with only

one machine gun, on the starboard side, with 400 rounds. The gun sight was the STAé type. It was equipped with a gun camera, oxygen equipment and parachute. In the winter period, instead of wheels, Zmaj-built skis manufactured "in accordance with the instructions and model 1.VP" were installed. For reconnaissance missions, one camera was mounted in the fuselage behind the pilot.

## D.1 improved and modified

Dewoitine fighters were the main fighter type and the backbone of V KSHS fighter aviation in the second half of the twenties. Unfortunately, there were many serious problems during D.1's service. Production machines exhibited worse characteristics than those on the pattern D.1bis and other minor deficiencies in the structure, which resulted in frequent repairs and many accidents, with six pilots killed. An unknown pilot flying an unidentified D.1 lost his bearings on 23 September 1927 and force landed in Bulgaria. While landing, he flipped the aircraft over. Both the aircraft and the pilot were returned through the Božurište Sofia airfield depot. On 18 March 1927 *kap IIk* Nikola A. Kutjenikov died at Novi Sad as the first victim of a D.1. Following the death of *por* Antun S. Šimunović on 12 April 1928 at the village of Rumenka near Novi Sad, when his D.1 lost its wings in flight, it became clear to the KV that it had to take some measures. The Zmaj factory repaired at least eight aircraft up to the end of spring 1929. *Kap IIk* Petar M. Petrović died flying a D.1 when he collided with a Breguet 19 on 27 April 1928 above Novi Sad airfield. During October and November 1928 at Novi Sad, a Czechoslovak licence-built Dewoitine D1 (s/n D1-14), the product of the Škoda factory (Škodovy závodi iz Plzen) with a 500 mhp Škoda L engine, was presented. Pilot Janko Markićević made four test flights in that aircraft. On 16 January 1929 *por* Miloš S. Jovanović, 6.VP pilot, died when his D.1 crashed near Zemun due to loss of speed. *Maj* Teodor Uzelac crashed on 11 June 1929 in the forest on Kozara mountain while flying from Novi Sad to Zagreb, completely destroying D.1 №27. Pilot Dimitrije Kneselac crashed on his back during a race on 6 September 1929 while he was conducting a loop and completely destroyed D.1 №8. He was saved by instinctively pulling his head into the cockpit. At that race, pilot Nikola Nikolić had an accident near Zenica with D.1 №19, suffering 20% damage. *Por* Ljubomir P. Jovanović, following a fire on D.1 №42, died from his injuries on 29 January 1931. Due to the frequent fires on D.1 fighters, pilots became fearful until the KV commission discovered the root cause, the splitting of carburettor pipes due to vibration at full throttle, which was resolved in 1930-1931. Perhaps the last D.1 lost in an accident was the one at Zemun airfield on 26 May 1937, in a crash involving a Potez 25 and a Dewoitine D.1, killing the Dewoitine pilot, reserve *ppor* Djordje J. Čkonjović. In the period of 1930-1936 a total of 20 VV fighters of all types were lost, of which a minimum of 13 were Dewoitines of both types. Adding to this, with the six destroyed fighters from the previous period and aircraft belonging to *ppor* Čkonjović, there were at least 20 destroyed Dewoitines.

To overcome the difficulties with D.1 fighters, engineer Dušan S. Stankov, who transferred on 1 April 1931 from *Фабрика аеро и хидроплана Икарус А.Д.* (Ikarus Aero and Hydroplane Factory) to KV, was assigned the task to resolve the apparent aerodynamic and structural problems. During the same year he completed an entire review of the aerodynamic and structural calculations and made new calculations. He discovered dynamic instability and several weak spots in the construction, and he recommended as a solution to adjust the centre of gravity, significant strengthening and modification of the horizontal stabilizer, and the construction of a new Hispano engine mount. VV Commander *gen* Milutin Đ. Nedić

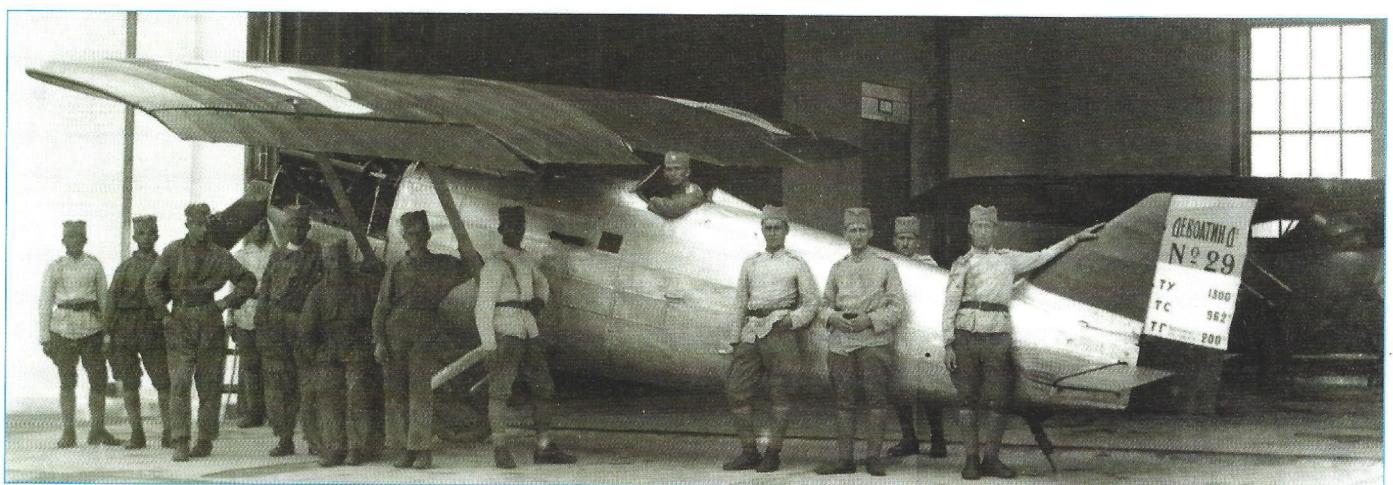


1.VP fighters, №36 and №24 in the background, Novi Sad, 5 September 1927. (Aviation Museum - Belgrade)

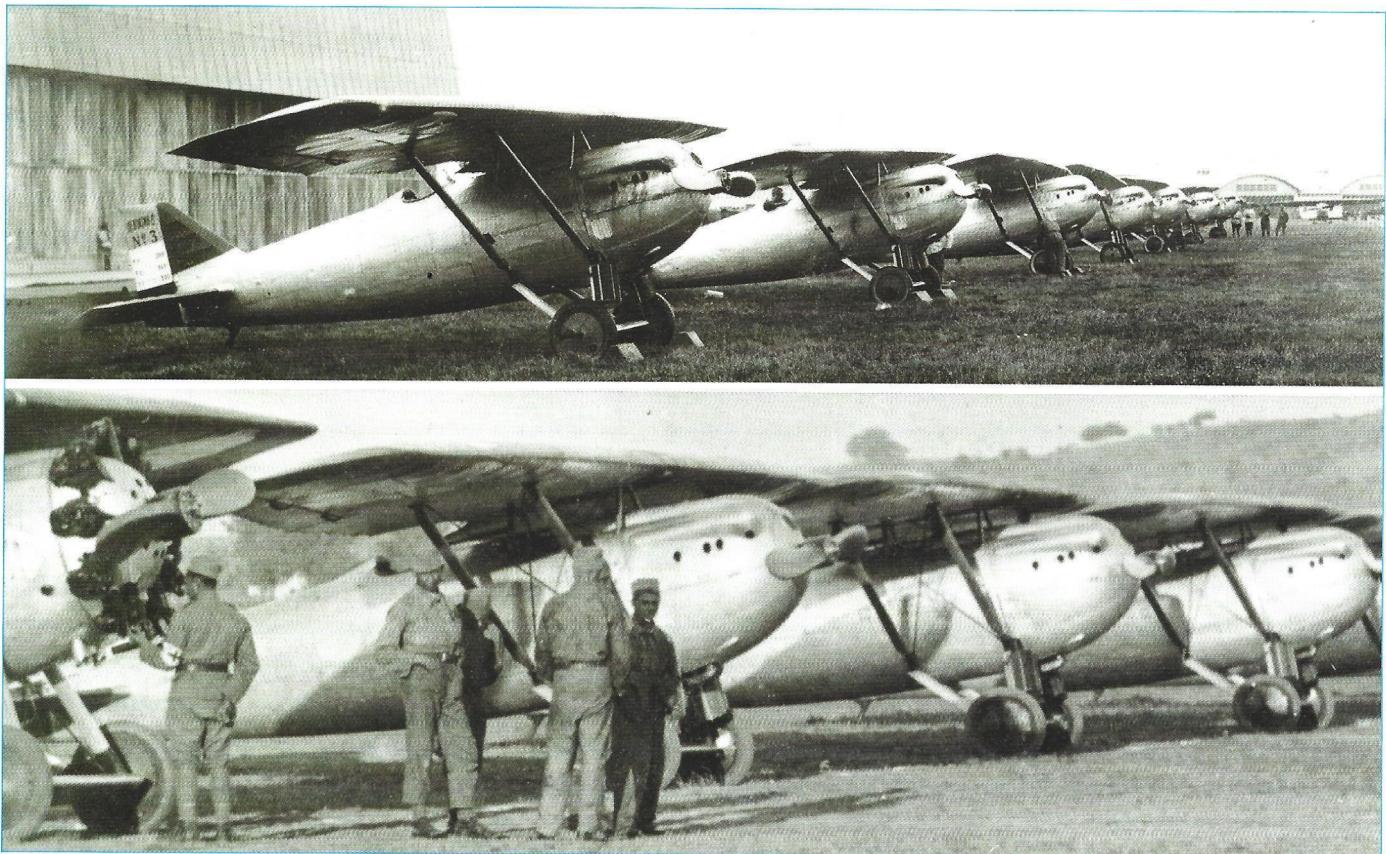
Two aviators in front of D.1 C1 №36. (Djordje Nikolic)



A dozen of ground personnel posing in front of №29, while the pilot is sitting in cockpit, Novi Sad, 1927. (Ognjan Petrovic)



Dewoitine D.1 fighters in 1927: (top) prior to transfer from Novi Sad to Belgrade. (Aviation Museum – Belgrade via Ćedomir Janić); (bottom) 125.VG lined up at Zemun. (Janko Dobnikar via Predrag Miladinović)





ordered in November 1932 the removal from service of all D.1 aircraft until the apparent deficiencies could be resolved, which led to significant weakening of the VV fighter aviation.

Most of the issues were resolved on the trial sample D.1 №12 and the special VV HQ commission, following flight testing, added a list of additional observed deficiencies, such as the instrument and switch layout, pilot seat width and others. VV HQ sent a request in the summer of 1933 to Zmaj to hand over all drawings and a study for the transformation of D.1 to Ikarus, which Zmaj reluctantly agreed to. The Ikarus factory, in accordance with this particular program, modified during 1934 a total of 16 D.1 aircraft which were for some time longer used at the Pilot and Reconnaissance School at Novi Sad. For his role in the modification project, engineer Stankov received the rights to a royalty, which amounted to a total of 5% of the value of the work done.

The importance of D.1 fighters reduced in 1931 when the Avia BH-33E was introduced into fighter units and some Dewoitines were transferred to fighter detachments. Their use lasted several more years and at the end of 1935 a total of 15 D.1s were still in service. In April 1936 Ikarus completed a general overhaul of 10 aircraft (№15, 17, 22, 26, 31, 33, 35, 36, 39 and 41). On 1 January 1938 there were nine D.1 fighters remaining, one serviceable and eight out of service. War time use was not considered, while the peacetime service was to stop at the end of 1938. In the spring of the same year at Zemun airfield, a D.1 performed aerobatics which further supports the justifications for the modifications by engineer Stankov. In the "Overview of permitted flight hours between overhauls" from 1939, for Dewoitines of all types it was stated that: "due to the material wear, aircraft are not recommended for overhaul", which effectively ended their service within VV.

One D.1 was showcased at the 1938 First International Air Exhibition in the open by the VV pavilion at the newly-built Sajmište (fair grounds), without the skin on the port wing and fuselage, allowing the public to see the structure. That aircraft was preserved for the Air Section of the Military Museum in Belgrade but was destroyed along with other artefacts during the 1941 April War.

## D.1 C1-Pollux project

According to the VV CO order No. 150 from 1929: "To prevent wear to the 300 K.S. Hispano engines and to ensure timely repairs, I order that: the 300 K.S. Hispano engines must be sent for an overhaul following 60 hours of use during normal service." After six years in service, due to wear and the relatively unsatisfactory performance of the Hispano 300 mhp engines, VV HQ considered changing the engine on the D.1 and continuing its

Another D.1 C1 fighters line up. The first of five aircraft is №42. (Tomaž Perme)

6.VP CO maj Miodrag Tomic, in flying suit in front of D.1 at Belgrade airfield. This photograph was published on the front cover of Ilustrovani list (Illustrated News) magazine. (№21, 27 May 1928)



Миодраг Томић, начелник пилотске групе у Београду, који је био први пилот који је у летовачкој школи испунио 60 часова највећим бројем. То је, у складу са првим прописом који је усвојен 1929. године, у складу са којим се мотори испуњавају и подлежу редовном објектијацији.



Ppor Janko Dobnikar poses in front of D.1 fighter, Zemun, 1928. (Janko Dobnikar family via Predrag Miladinović)

Interesting shot of V KSHS fighters in 1929: a BH-33E (in the center), two D.9s (left and right from BH-33E) and D.1s (the rest). (Aviation Museum – Belgrade)

use as a transition aircraft. The attempt by VV HQ to extend the life of D.1 by changing the engine and purpose, led to the adaptation to the Czechoslovak air-cooled 9-cylinder Walter "Pollux" radial, which had a nominal power rating of 320 mhp at 1,800 rpm and maximum take-off power of 380 mhp at 1,900 rpm. However, the D.1 with "Pollux" engine (designated in Zmaj documents as D1 C1-Pollux) did not take off, it remained in the project phase because the Ministry of Finance did not approve funds to purchase the engines for this purpose. On 19 September 1932 VV HQ informed the Zmaj factory, as a response to the factory offers from 2 and 30 August, that due to the refusal to purchase the Pollux engine, the administrative steps for the approval of the conversion of Dewoitine aircraft are closed.

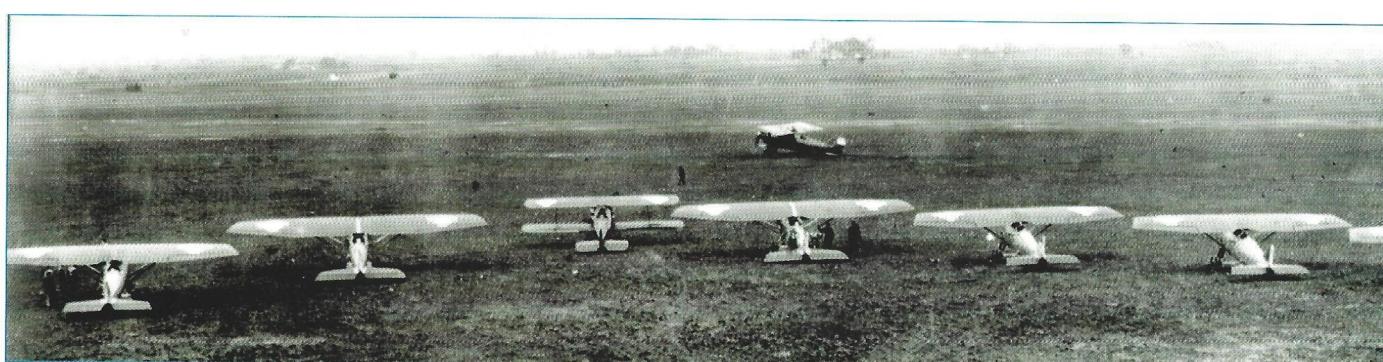
## D.1 C1-K7 prototype

Still acting in accordance with the intent to change the engine on D.1 fighters, HQ circulated a letter on 12 January 1933 asking the Zmaj factory for "transformation of 16 Dewoitine aircraft to an air cooled engine". Engineer Stankov, who was from 1 April 1933 the technical director and the head designer at Zmaj, completed the study and HQ offered on 14 July 1933 the conversion to K7 engines with the request to Zmaj to hand over the documentation to the Ikarus factory. The contract with Zmaj was signed for the adaptation of D.1 to two types of radial engines.

One of the planned engines was the K7, a product of the Gnôme-Rhône factory, the same type which engineer Stank-

ov somewhat later used to power his new and successful conversion trainer, the Zmaj FP-2. According to the construction, appearance and power, that engine was similar to the Jupiter engine which powered the newer Dewoitine D.9. On 4 March 1933 the Zmaj factory informed VV HQ about the necessary changes to the engine mount and HQ ordered on 16 May that those changes be implemented. The factory bureau at Zmaj, under the leadership of Stankov, produced technical documentation and the IAM factory from Rakovica near Belgrade provided on 5 July 1933 a report to the Zmaj factory with engine data. From the report, it was evident the engine was the air-cooled 7-cylinder Gnôme-Rhône 7Kse Titan Major radial (known in VV as K7, K-7 or K7se) with nominal power of 420 mhp at 2,120 rpm at sea level. The Zmaj factory officially received engine K7 №7300 and a propeller as late as 12 October 1933 at Technical Park of 6.VP. The work on the adaptation of D.1 №16 was completed on 31 March 1934 and Zmaj handed over the aircraft in accordance with the contractual requirements. During the same year *Ваздухопловна опитна група* (VOG – Aviation Test Group) tested its performance. Unfortunately, the prototype, named D1 C1-K7, that is D1-K7 420 KS, was destroyed when during one of the flights its pilot fell out of the aircraft. Further conversions were not worked on because HQ gave up on the revitalization of the D.1 and began considering the possibility to purchase other fighter and transition types.

For the modification of №16, apart from the new engine, a new engine bearer, aerodynamic Townend-ring type cowling, a fuselage segment behind the engine, fuel and oil installation and propeller were used. The spinner was similar to that on Polish PZL fighters.



# Camouflage and markings

## Designation

The general factory designation was D.1 C1 (*Dewoitine 1 Chasseur 1*) and the type designation D.1ter. The official V KSHS and later VV designation was *Девоатин Д1 Ц1* (Dewoitine D1 C1) or *Девоатин Д1* (Dewoitine D1), often with “1” in superscript. The designation according to the engine was Dewoitine-Hispano or Dewoitine 300 KS. Sometimes, shortened versions were used as well such as *Д1 Ц1* (D1 C1), *Д1* (D1 – Dewoitine 1) and *ДЦ* (DC – Dewoitine Chasseuer).

Zmaj-modified conversion was designated as D1 C1-K7, that is *Девоатин Д1-К7 420 КС* (Dewoitine D1 C1-K7).

## Serial Numbers

The pattern D.1bis carried №06 as the sixth pre-series example. During the introduction into V KSHS service, production Dewoitine fighters first received serial numbers №1 to №44, according to the newly adopted system for serial numbering of military aircraft.

## National insignia

During their entire service, D.1 fighters carried standard “Kosovo cross” insignia at four wing locations and the national flag across the entire rudder.

## Inscriptions and special markings

The pattern №06 had a Black monogram of pilot Teodor Uzelac on the fuselage. On the vertical stabilizer in two columns the type and number (D.1 and C1 №06) were written and in four columns French abbreviations for aircraft weights (P, PE, PC and PT).

Production machines, in accordance with V KSHS and later VV standard, used standardized Cyrillic inscriptions across the flag on the rudder. On the Blue field, the type of the aircraft was written in large letters in Serbian (*ДЕВОАТИН Д1* = DEWOITINE D<sup>1</sup>) along with the s/n (№). On the middle, White field, in three rows the abbreviations (TY, TC, TG = TU, TS, TG) and weights were written. On the side of the fuselage the s/n was repeated in French font and sometimes with larger dimensions. Some machines at different time periods had large White code numbers applied on the vertical stabilizer.

## Camouflage Scheme

D.1 aircraft were partly factory painted in the characteristic protective finish which was carried during their entire service period in the Kingdom. Metal surfaces (fuselage) were in the highly polished natural Aluminium, and all fabric covered surfaces (wings, stabilizers and rudder) were painted Dark Green.



A group of officers sitting in front of №42. Note STAé type gun sight and a rear view mirror. (Milan Micevski)

### Aircraft Characteristics\* CAED-built Dewoitine D.1bis (VV Dewoitine-Hispano)

Quantity used:	1
Crew:	1
Years of Service:	1924-1926
Span:	11.5 m (37.7 ft)
Length:	7.5 m (26.6 ft)
Height:	2.75 m (9.0 ft)
Wing area:	20.0 m <sup>2</sup> (215 ft <sup>2</sup> )
Engine:	One 300 mhp Hispano-Suiza 8Fb
Empty weight:	820 kg (1,808 lb)
Loaded weight:	1,240 kg (2,734 lb)
Maximum speed:	260 km/h (161.5 mph) at 2,000 m (6,562 ft)
Service ceiling:	9,000 m (29,529 ft)
Armament:	Two synchronized 7.69 mm Vickers M.1909 machine guns

\* Data from testing of D.1bis №6 at Novi Sad with a total load (fuel, oil, pilot and other) of 400 kg.

### Aircraft Characteristics\* SECM-built Dewoitine D.1 C1 (VV Dewoitine-Hispano)

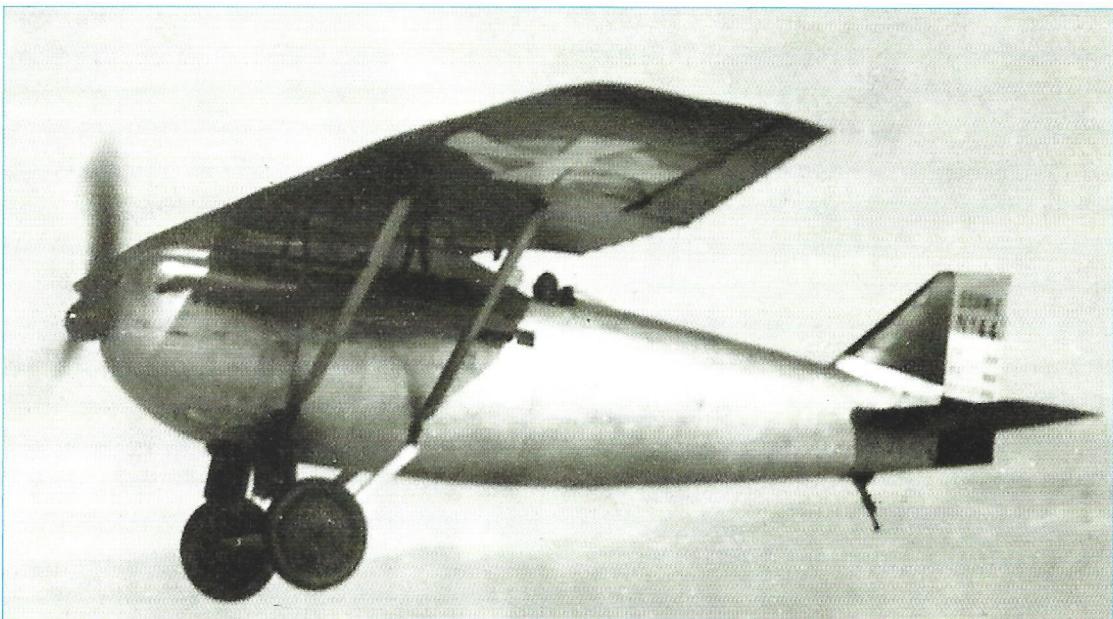
Quantity used:	44
Crew:	1
Years of Service:	1926-1939
Span:	11.5 m (37.7 ft)
Length:	7.5 m (26.6 ft)
Height:	2.8 m (9.0 ft)
Wing area:	20.0 m <sup>2</sup> (215 ft <sup>2</sup> )
Engine:	One 300 mhp Hispano-Suiza 8Fb
Empty weight:	962 kg (2,121 lb)
Loaded weight:	1,300 kg (2,866 lb)
Maximum speed:	250 km/h (155 mph) at 2,000 m (6,562 ft)
Service ceiling:	8,300 m (27,232 ft)
Range:	400 km (248 ml)
Maximal climb:	7.5 m/s (24.6 ft/s)
Armament:	Two synchronized 7.69 mm Vickers M.1909 machine guns

\* Somewhat different data is given in domestic literature from 1928: maximum speed of 220 km/h (137 mph), climb time to 2,000 and 4,000 m in 06 min 00 s and 15 min 30 s respectively, maximum altitude 6,500 m (21,325 ft), according to factory data 7,500 m (24,606 ft), endurance 2 h 45 min.

### Aircraft Characteristics\* Zmaj-mod. Dewoitine D.1 C1-K7 (VV D1-K7 420 KS)

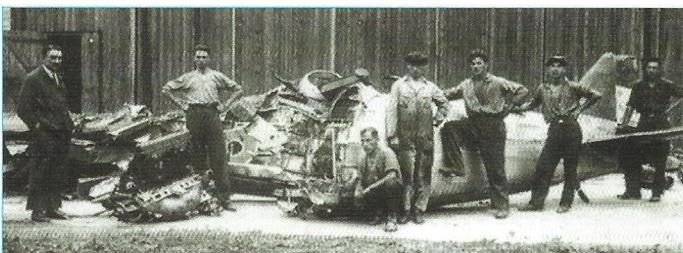
Quantity used:	1 conversion
Crew:	1
Years of Service:	1934
Span:	11.5 m (37.7 ft)
Length:	7.4 m (24.2 ft)
Height:	2.8 m (9.0 ft)
Wing area:	20.0 m <sup>2</sup> (215 ft <sup>2</sup> )
Engine:	One 420 mhp Gnôme-Rhône 7Kse Titan Major

\* The remaining characteristics are unknown

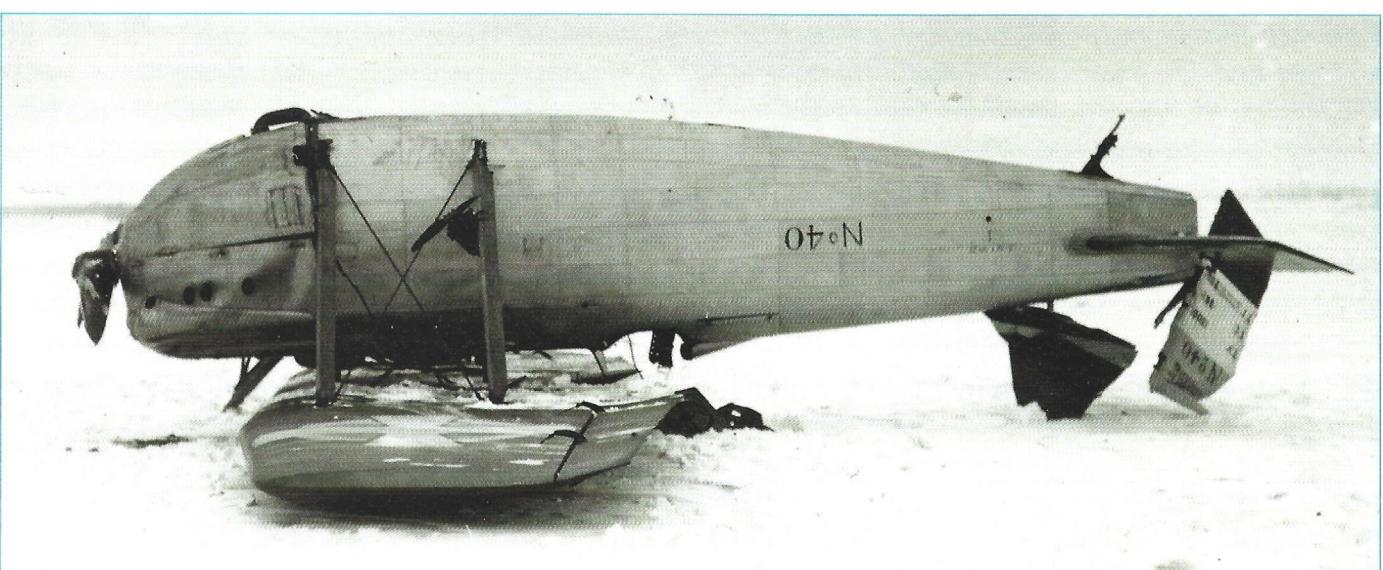


*Rare shot of №44 in flight.  
(Aviation Museum – Belgrade  
via Šime Oštarić)*

*D.1 C1 accidents: (top left)  
broken fuselage at Novi Sad  
1929 (post card); (top right)  
maj Teodor Uzelac crashed  
on 11 June 1929 in a forest  
at Kozara flying №27 from  
Novi Sad to Zagreb, the  
aircraft was 100% destroyed  
(via Miloš Milosavljević);  
(bottom left) pilot ppor Mate  
Kuzmanić flipped over his  
№21 on 21 April 1931 (Milan  
Micevski); (bottom right)  
remains of an unknown  
D.1 at Novi Sad. (Djordje  
Nikolić)*



*Nar Milan Bjelanović crashed №40 at Novi Said airfield on 21 February 1929. This is an official photograph by the Military Investigation Commission, report №12. (Mario Raguž)*



Nº13 during preparation for take-off, pilot ppor Franjo Džal, 1929. (Aleksandar Ognjević)



Daily maintenance on Nº29.  
(Miloš Milosavljević)



An officer pictured in front of Nº24. This machine had gun sight and a rear view mirror. (Aviation Museum – Belgrade)



Nº30 "White 7", Zagreb airfield, September 1930.  
(Miloš Milosavljević)



Nº13 prior to take-off.  
(Milan Micevski)



Opened engine cowling on  
Nº5. (Miloš Milosavljević)



D.1 C1 fighters during take off: (top) air show at Borovo on 12 May 1934. (Robert Čopeč); (bottom) Fighter Escadrille in Belgrade. (Djordje Nikolić)



Two fuselages during general  
overhaul at Zmaj factory,  
circa 1930. (Čedomir Janić  
via Ognjan Petrović)

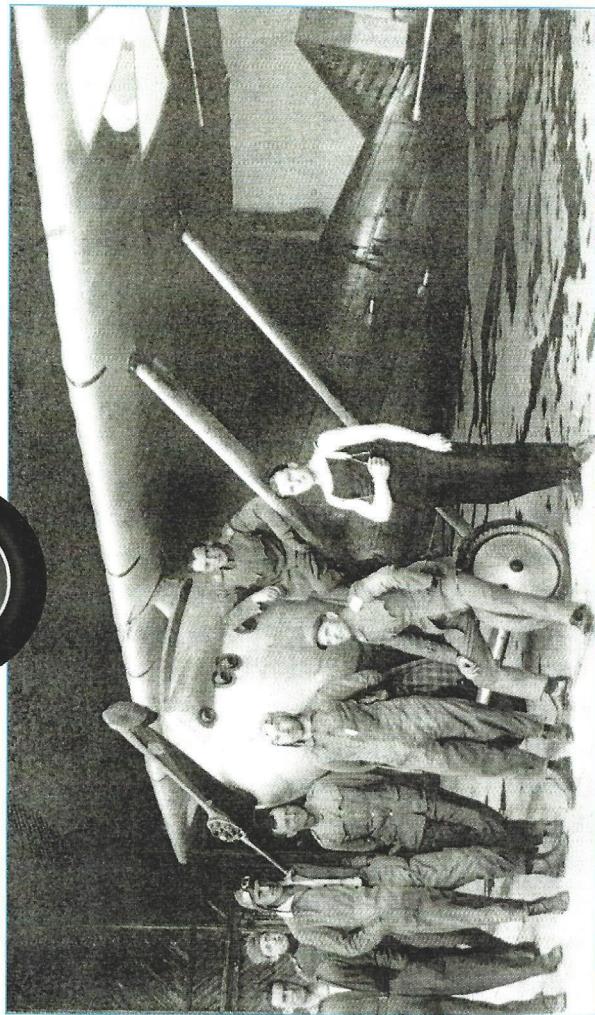


140 cm diameter "Kosovo cross" wing position.

Artwork by №946/19  
Ognjan M. PETROVIĆ



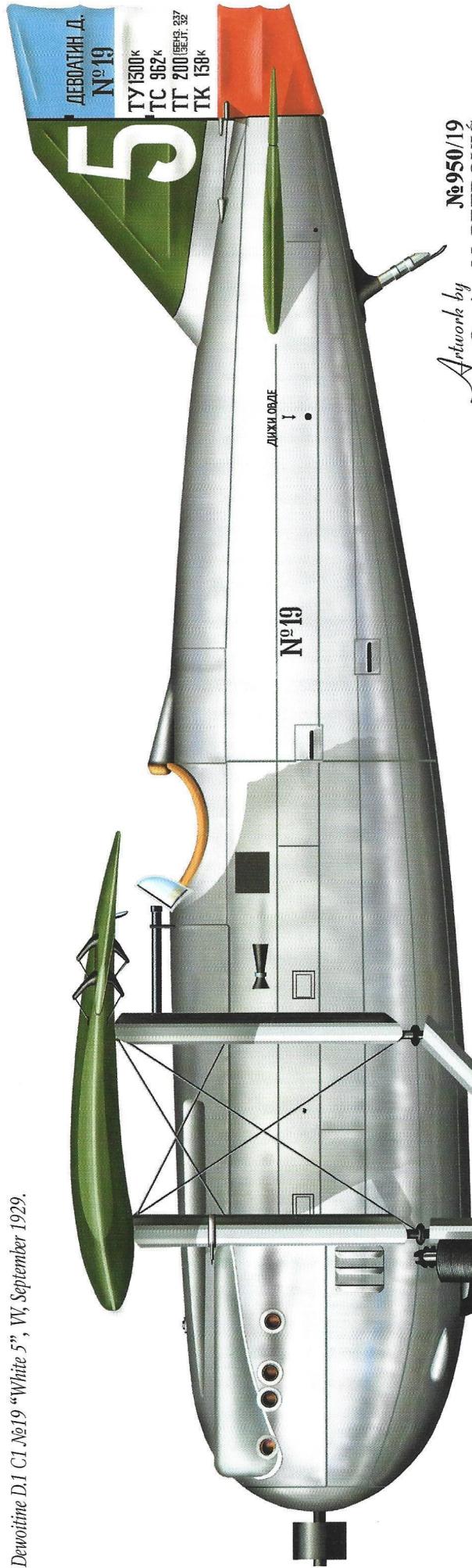
Factory applied tail inscriptions.



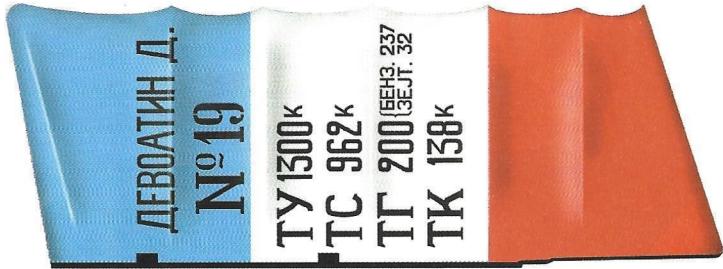
A group of 1.VP ground and flying personnel in front of №6, while pilot kap Teodor Uzelac is sitting on the wing strut. Overall Aluminium/Silver dope painted, this machine carried at the time standard national insignias, rudder flag, personal emblem of kap Uzelac on the fuselage and original French inscriptions on the vertical stabilizer. Note oblique border line between colours on the flag. (Janko Dobnikar via Predrag Miladinovic)



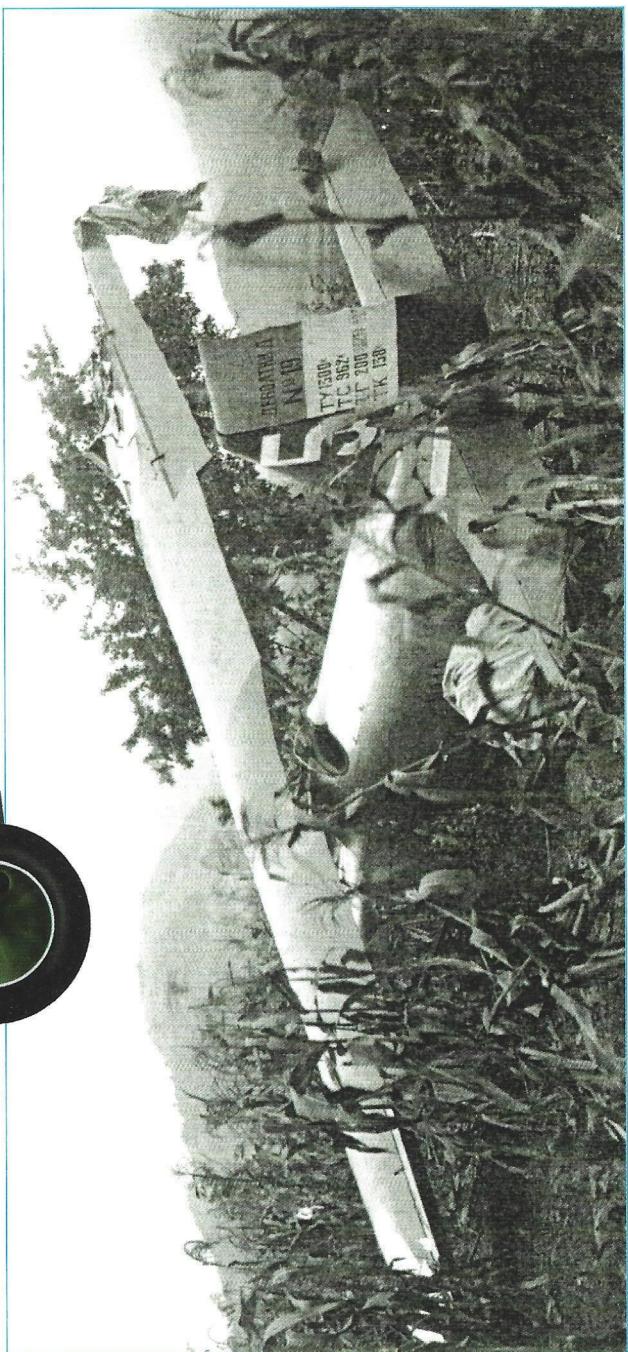
Dewoitine D.1 C1 №19 "White 5", VV, September 1929.



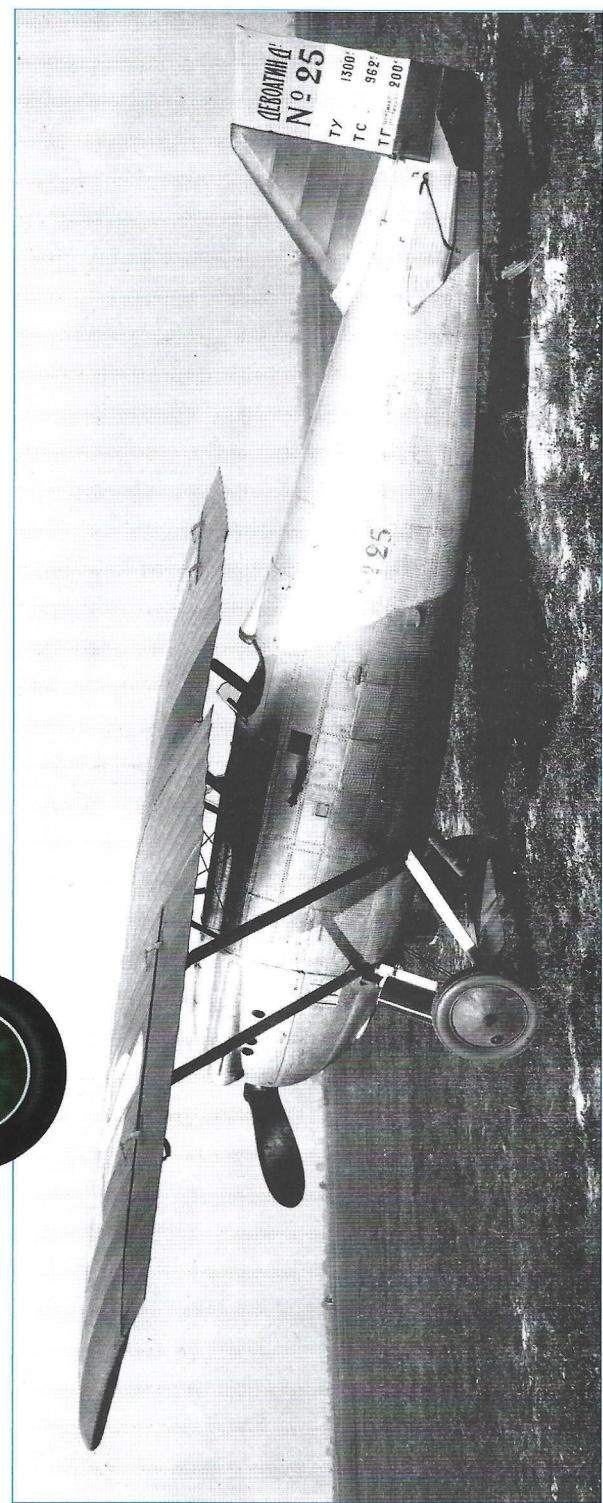
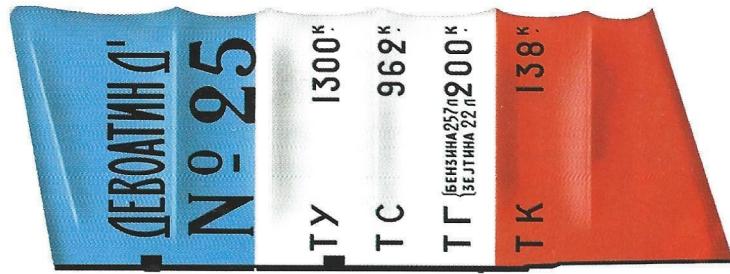
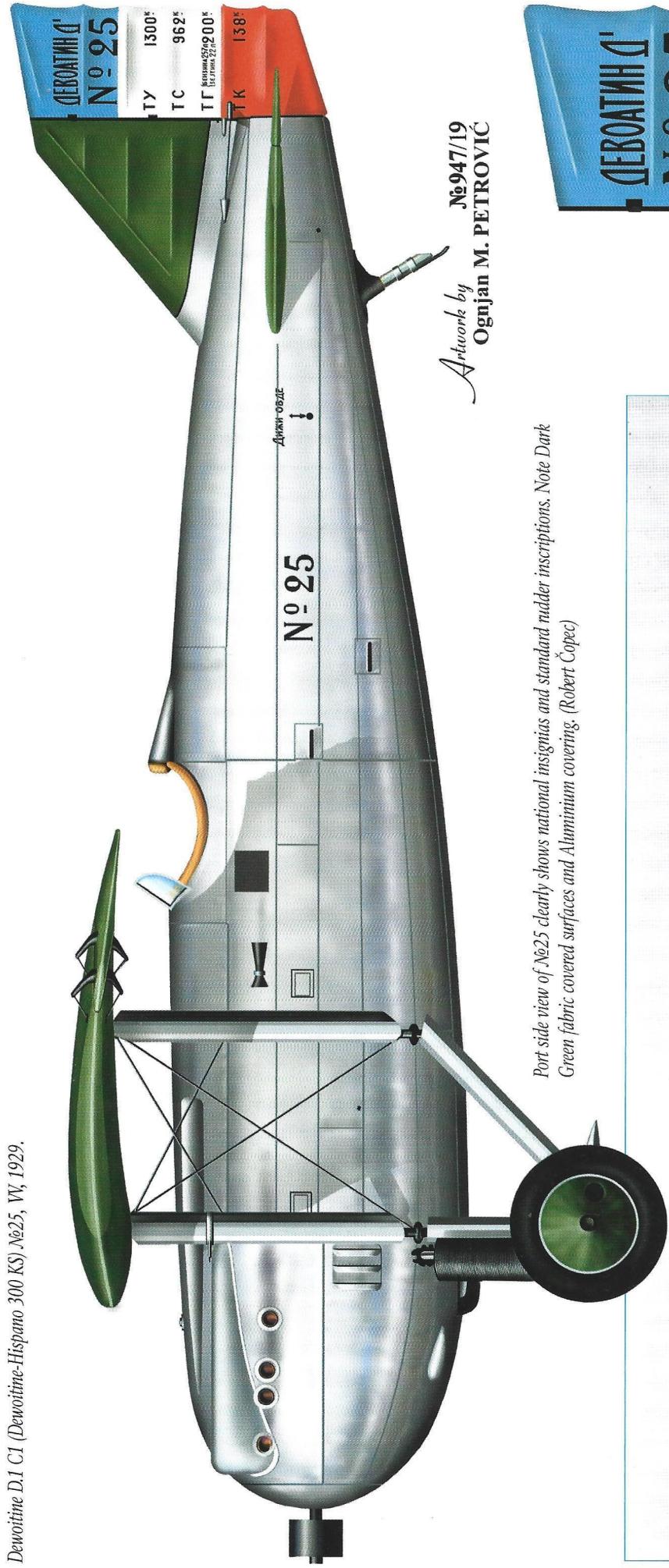
*Artwork by*  
№950/19  
Ognjan M. PETROVIĆ



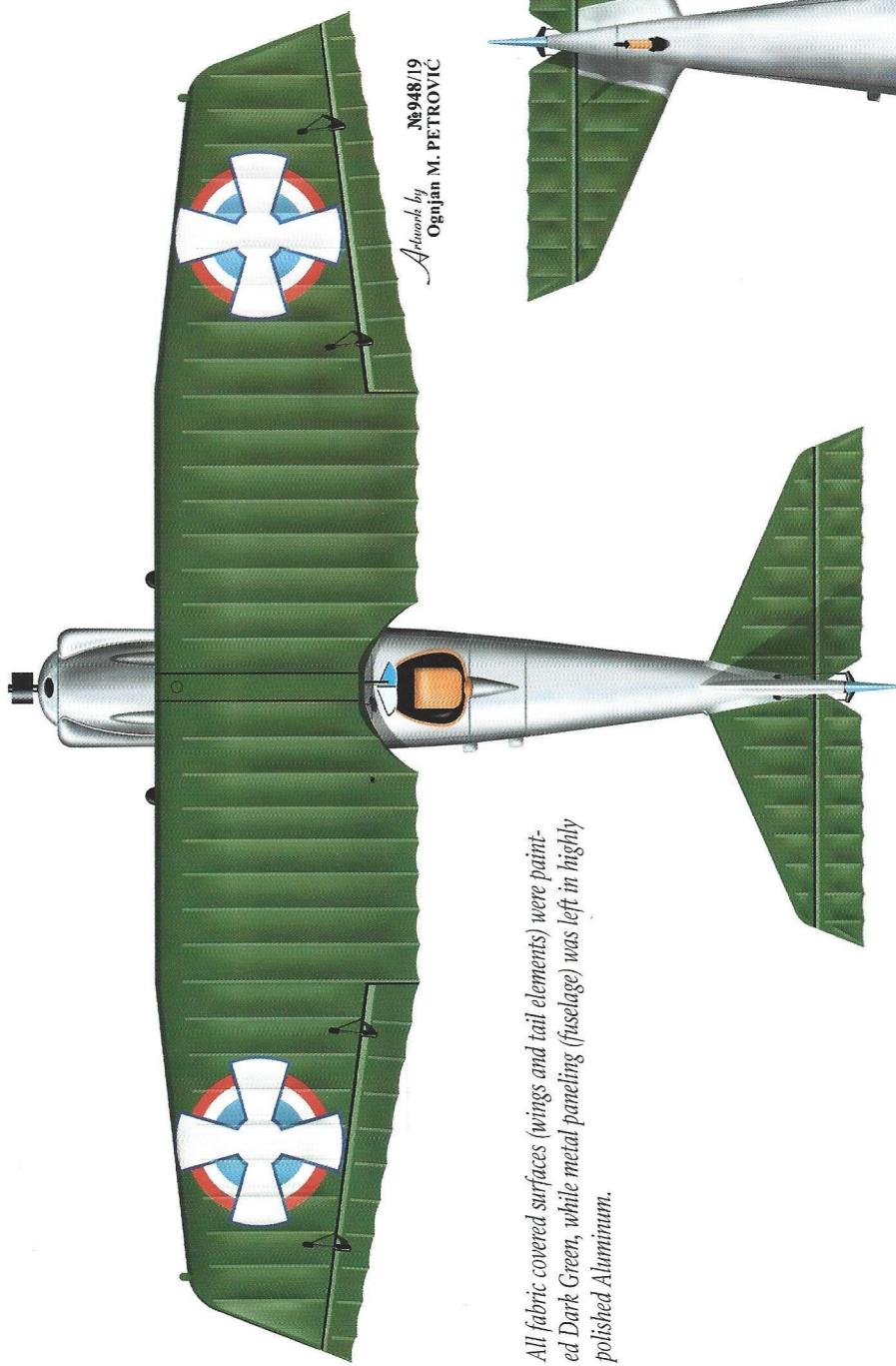
Pilot por. Nikola Nikolić damaged №19  
"White 5" during King's Trophy race on  
6 September 1929 near Zenica. (Sime  
Oštric)



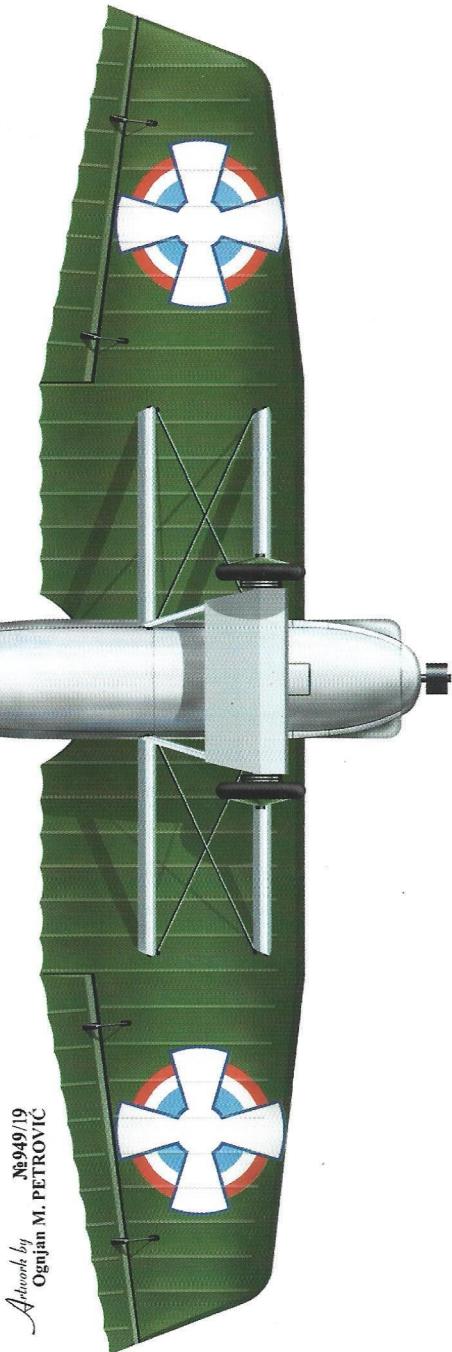
Different style of number inscriptions on  
this machine.



Upper and under views of D.1 C1 №25 clearly show new camouflage scheme which was introduced with arrival of series-built Dewoitine D.1ter versions in the inventory of V KSHS.

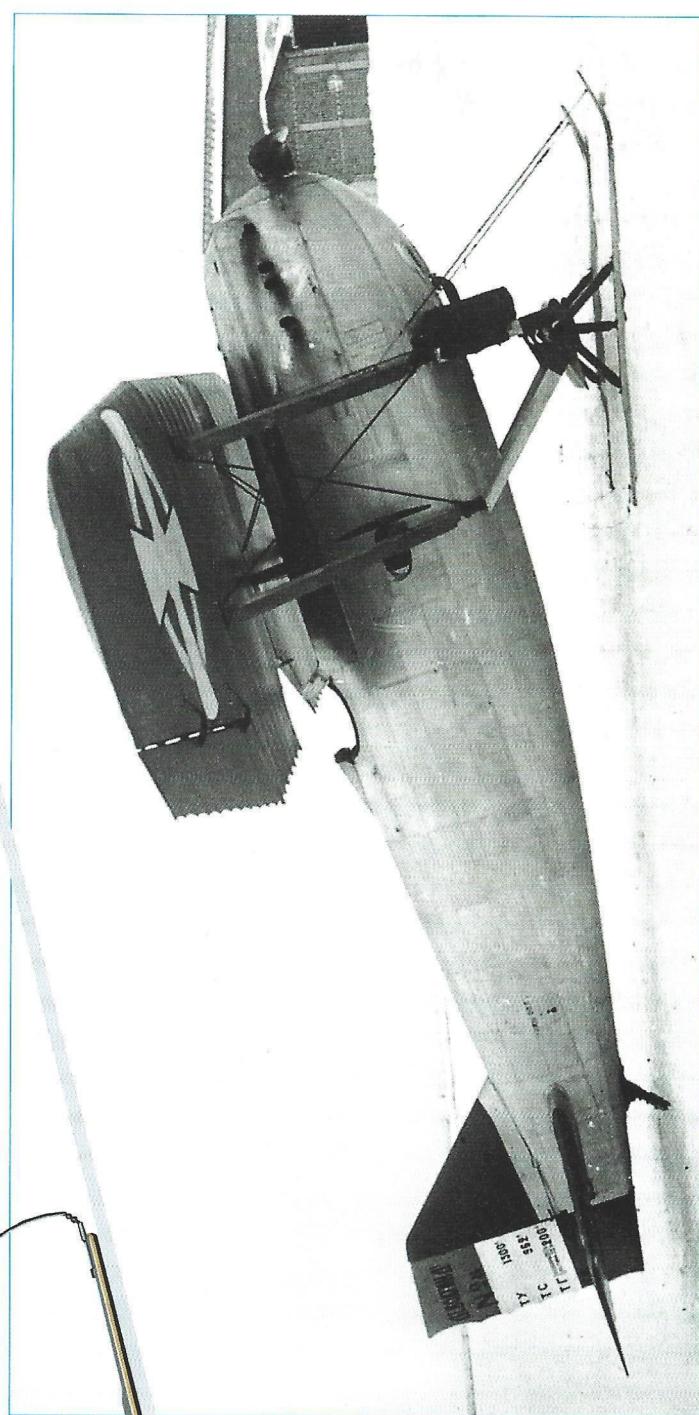
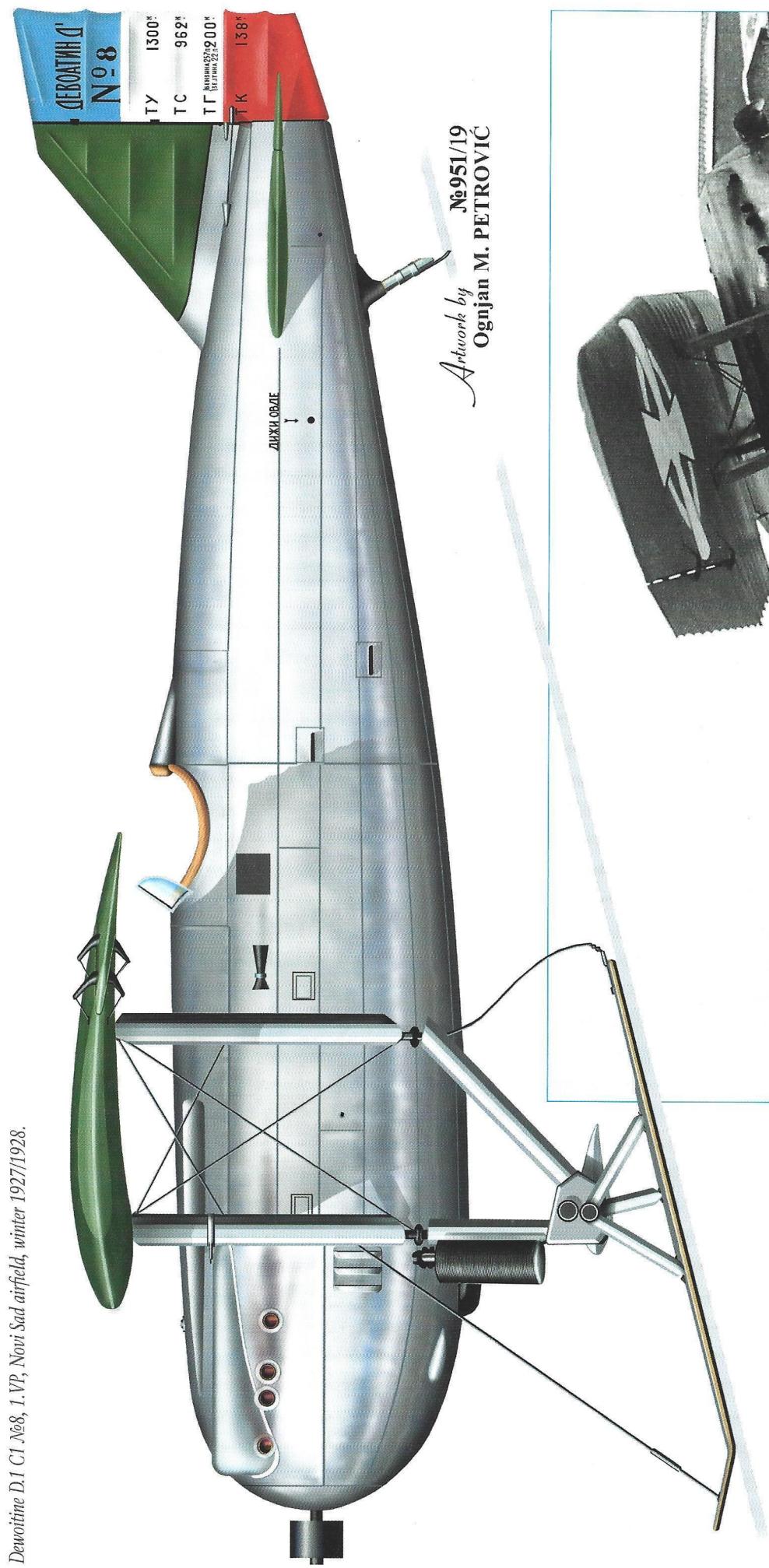


Standard 145 cm diameter national insignia in the form of "Kosovo cross" cockades were applied in four wing positions. Note that series aircraft had cockades slightly moved towards the fuselage in relation to the sample D.1bis №6 machine.

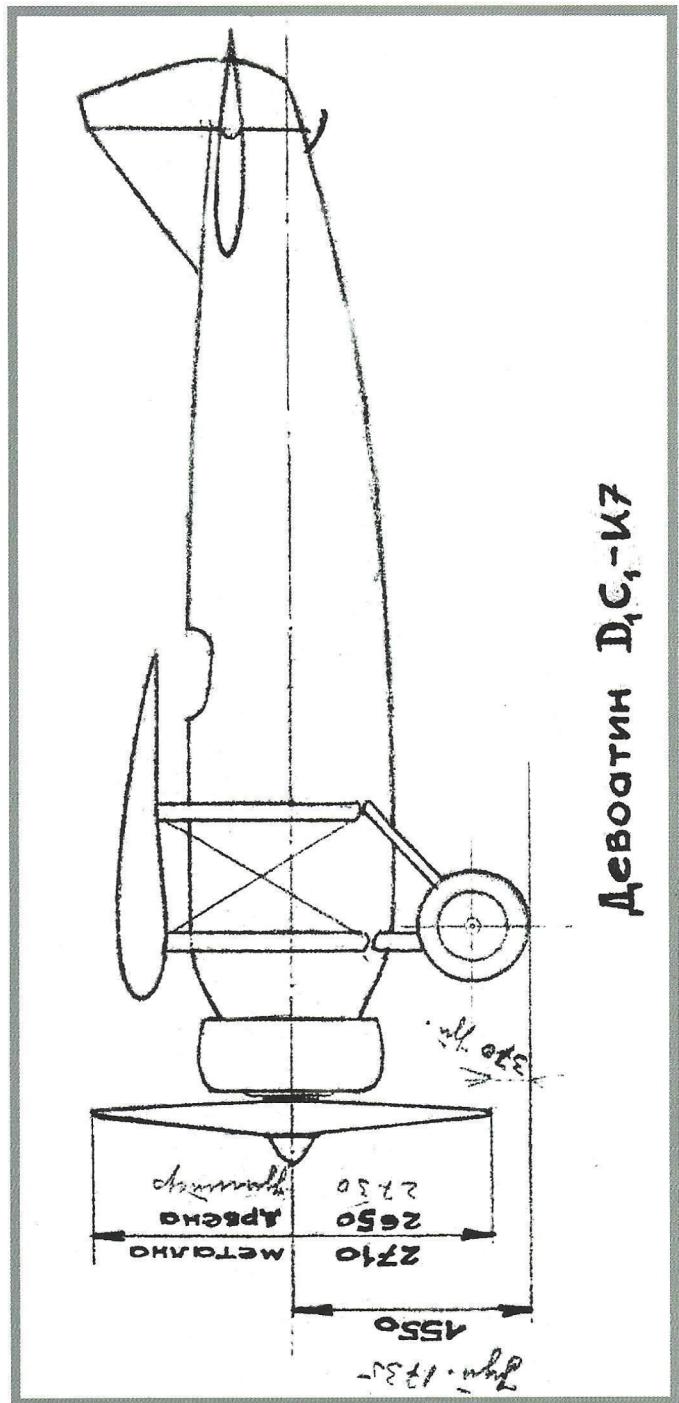
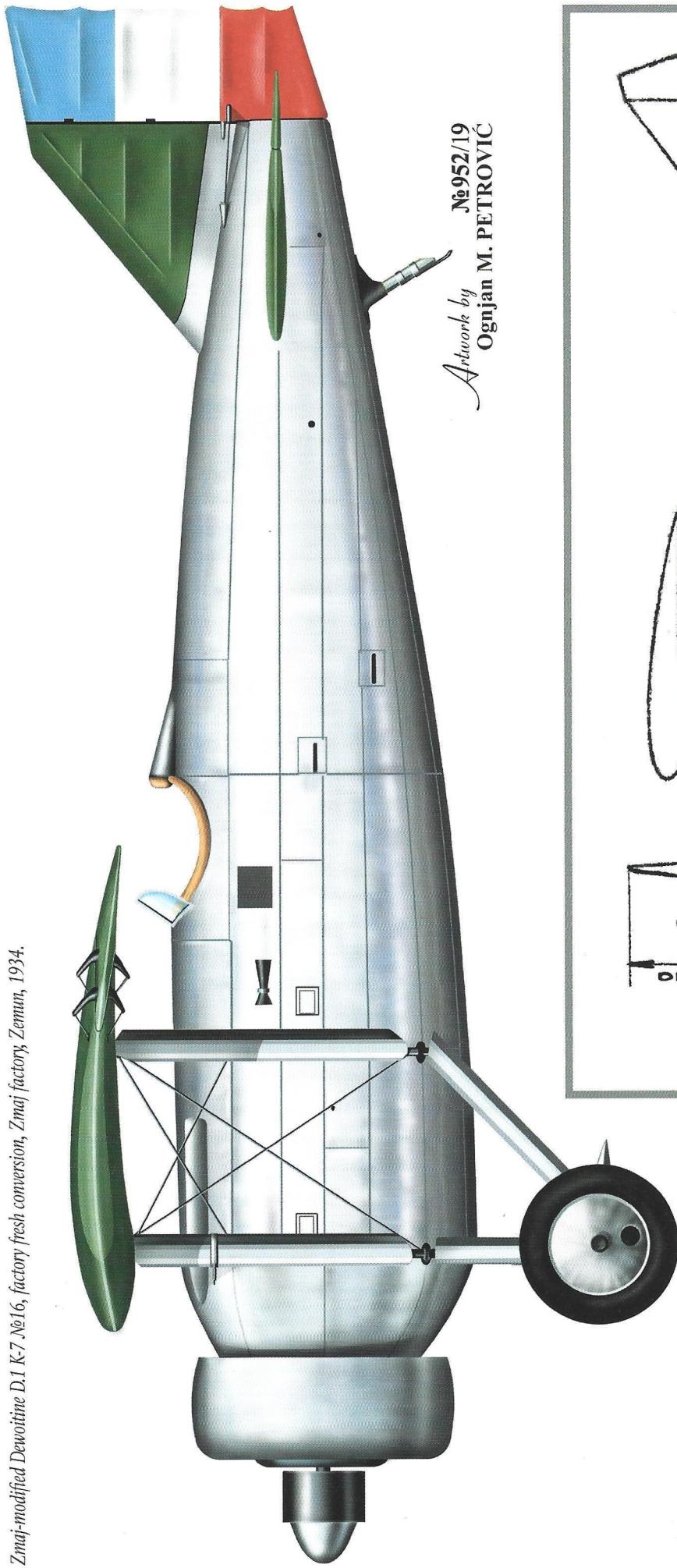


*Dewoitine  
Hispano*

Dewoitine D.1 C1 №8, 1.VP, Novi Sad airfield, winter 1927/1928.



№8 was equipped with skis attached via three short struts (two angled and one vertical) to the wheel axle. Dimitrije Kneslac had an accident while flying this aircraft in 1929. (Aviation Museum – Belgrade)



Original sketch made by Dušan S. Stankov, Technical manager and head of Zmaj design bureau, engineer who was responsible for D.1 modification to K7 engine. As Stankov hand wrote on the sketch, three propeller types were planned for this modification. Two versions of K7 type propeller; wooden (diameter 2,650 cm) and metal (diameter 2,710 cm), and one originally built for Jupiter engine (diameter 2,730 cm) could be used. Engineer Stankov also noted distance from propeller axle to ground (1,550 cm) and propeller clearance (370 cm for Jupiter type propeller). Note that the new nose section, engine bearer and Townend ring were added, while original water cooler was removed. (Belgrade City Archive)

*Remembrance photograph with fighter pilots, participants at the King's Trophy race on 6 September 1931: (from left to right) nar Rade Samolov, ppor Milan Bjelanović, kap IIk Radoslav Žorž Djordjević, ppor Dragomir Nikolić, ppor Janko Dobnikar and nar Bernard Jeranča (Janko Dobnikar via Predrag Miladinović)*



Reserve ppor Rodoljub Rodja Milovanović (later pilot with Aeroput Airlines and post-war JAT) climbing in D.1 №4. Photograph was taken on 10 November 1931 in Belgrade, and the pilot wrote a memo to his fiancé. Note the White flying suit and the parachute. (Dejan Milojević)



One D.1 C1 was displayed at the 1<sup>st</sup> International Air Exhibition in Belgrade held between May and June 1938. Note that the fabric skin on the port wing and partial metal skin on the left side of the fuselage are removed. (Šime Oštric)



# Dewoitine D.9 C1 (VV Dewoitine-Jupiter)

## Background

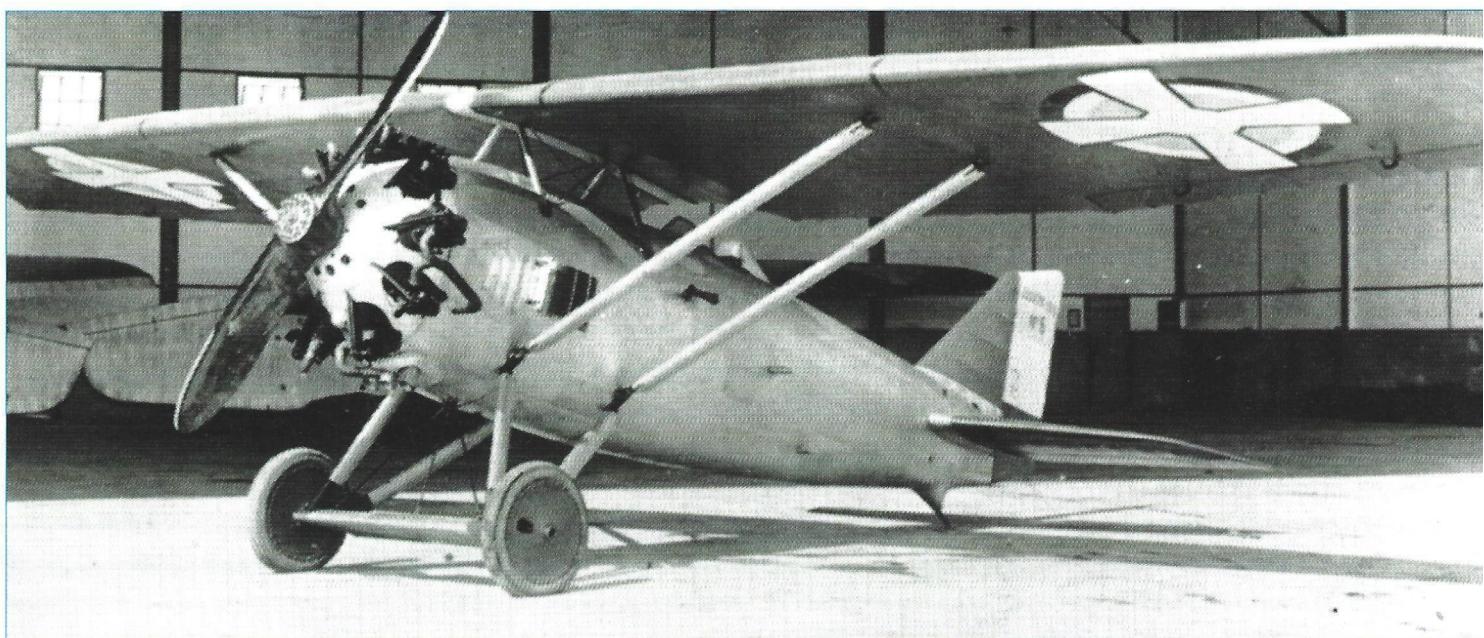
The Dewoitine D.9, designed by Émile Dewoitine, was a direct derivative of the D.1bis. This type was created in response to a specification drafted by the French Air Force in 1923. It was essentially an older type aircraft modified with a more powerful 420 mhp Jupiter radial engine. The first prototype, D.9-01, began testing in June 1924 and the final version of the prototype, with larger wing surface area than its predecessor, was constructed the following year. Italy was the first buyer and at the beginning of 1924 it placed an order for one D.9 plus one pre-series D.1 for testing purposes, and the Ansaldo factory produced between 1925 and 1926 a total of 147 licence-built D.9s designated AC-3 (*Ansaldo Caccia 3*). In 1925 the CAD factory produced only seven D.9s (one for Belgium and six for KSHS) and in 1926 three more (in parts) for Switzerland, which represented the entire production of the type in France. Series production D.9s were identical to the prototype with only the oil tank relocated from the bottom of the fuselage to the side. The French never accepted the D.9 (like D.1, apart from those used by the Navy) for its Air Force, hence Italy became, as with the D.1 type, the largest user of the D.9.

## Service in the Kingdom

As a supplement to a series of 44 D.1s, V KSHS received a delivery of six D.9 fighters in 1926. The reason for the purchase of such small numbers of D.9s was due to the wish of planners in V KSHS to test the new Jupiter engine (available in 1925), which would several years later get accepted into production in KSHS. Those six engines were the first Jupiters used in the country and the D.9 was the first fighter aircraft in the Kingdom with the Jupiter engine, and the first fighter with a radial engine.

Three new D.9 fighters participated from 12 to 21 August 1927 at the 2<sup>nd</sup> International Air Meeting in Zürich (*Meeting Aérien de Zürich*). Pilots who took place in the event were *kap I<sup>k</sup>* Teodor Uzelac, *kap II<sup>k</sup>* Dragutin Rubčić and *kap II<sup>k</sup>* Janko Markićević. In the logbook belonging to Janko Markićević,

Factory fresh D.9 №6 was one of the six aircraft purchased for the V KSHS in 1926. Dewoitine D.9 C1 was the first VV type to use Jupiter engine in the country and the first fighter with a radial engine. (Marko Babić)



A W pilot is resting on the wheel of brand new №2. Another D.9, №5 is visible to its left. (Janko Dobnikar family via Predrag Miladinović)



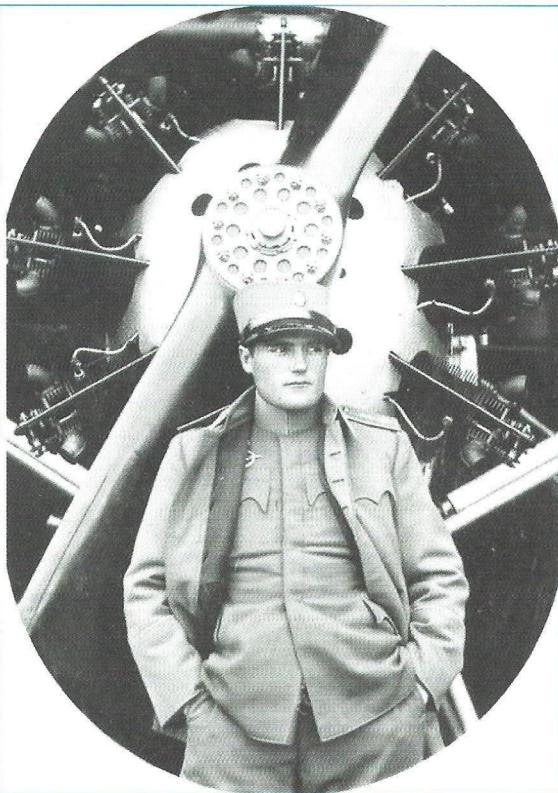
A sole D.9 C1 №6 in a line up with no fewer than seven D.1 C1s. Engines are running and aircraft are about to take off. (Dejan Milojević)

D.9 C1 №5 "White 1" parked next to D.1 C1 №25 "White 10" (Šime Oštrić via Ognjan Petrović)



Celebrating the 10<sup>th</sup> anniversary of the Macedonian front breakthrough, 1928. Fighter pilots of "combined fighters regiment" which participated in the celebration, including (sitting in the first row, the fourth from the left) ppor Dimitrije Kneselac; (standing in the second row, eleventh from left) maj Miodrag Tomić 6.VP CO, (twelfth) maj Teodor Uzelac, (thirteenth) kap Janko Markićević. (Djordje Nikolić)





VV aviators posing in front of D.9 C1: (left) two officers at Novi Sad in 1927 (Aviation Museum – Belgrade via Šime Oštrić); (right) ppor Dimitrije Kneselac in front of the Jupiter radial. (Milan Micevski)

a flight was logged between 10 to 16 August in a Dewoitine Jupiter 420 KS along the route Novi Sad-Zagreb-Milano-Zürich and between 16 to 30 August and 1 September for the return flight.

D.9s competed in King's Trophy race for the first time on 6 September 1928, when *kap IIk* Sergije Šebaljin flew the sole D.9 (number 5) competing against five D.1s. In 1929 two D.9s and four D.1s participated in the fighter air race. *Por Božidar Kostić* (CO of 6.LP as *ppuk* in 1941) and *kap IIk* Franja Rus piloted numbers 2 and 4 respectively. The air race for King's Trophy was not held in 1930, while two D.9s and four newly-arrived Avia BH-33Es participated in this competition on 6 September 1931. Pilots flying the D.9s were *nar* Bernard Jeranča and *kap IIk* Radoslav Djordjević (CO of 4.LP as *ppuk* in 1941).

The Zmaj factory was assigned to repair and overhaul Dewoitine fighters. In 1929 there was a need to replace the fabric on some Dewoitines of both types, hence Zmaj won the business in January of the same year to replace the fabric and revarnish all 20 D.1 and D.9 aircraft from 6.VP. During the same year Zmaj repaired "four wing sets for Dewoitines". During the early 1930s, D.9s were repaired by the *Аеропланска радионица 1.ВП* (1.VP's Aeroplane Workshop).

Dewoitine Jupiter fighters flew in parallel with the more numerous Dewoitine-Hispano, and in the 1930s, due to still being considered prestigious aircraft, they served for training and aerobatic flying. At an event called the "Национални авијатички митинг" ("National aeronautical rally") which took place on 4 June 1933 at Borongaj airfield at Zagreb, under the sponsorship of his highness Prince Pavle (Paul), numerous aerobatic were demonstrated by "a patrol of three single seat combat aircraft" type D.9 from Novi Sad based 1.VP. That "patrol" was the first unofficial flight demonstration group in the Kingdom.



In mid-1936 the Fighter Pilot School had four D.9s, one of which was №5 shown here. (Djordje Nikolić)

*A rare shot of a WD.9 C1 in flight. (Janko Dobnikar family via Predrag Miladinović)*



*The first of six purchased machines, №1, here at Zemun airfield. Note the Cyrillic inscription ДИЖИ ОВДЕ (lift here) in front of the tail surfaces. (Mario Raguž)*



Pilot schools within 1.VP and 6.VP used D.9s during 1931. In a logbook belonging to *por* Mihailo Akrit, flights in 6.VP's Fighter School were logged during the summer of the same year in different types such as Spad 7, Loire-Gourdou-Lesseure LGL B3 (LGL-22-ET1-B3), Dewoitine D.9 and Avia BH-33E. From 7 August to 27 November Akrit completed 10 flights in D.9 №1 and these flights were verified with a seal from PS. From June to November 1933, the same pilot conducted 11 flights, from March to May 1934 another 11 and during May to July 1935 four flights. All flights were made in №1 and were verified by a seal from 71.E from Skoplje, which was equipped with Jupiter-powered Potez 25A2 two-seaters. *Por* Akrit conducted various missions in the D.9: training circuits, test flights, training, escort, navigational flights, air combat with military two-seaters and mostly aerobatics. It is interesting to note that he flew his D.9 from Skopje airfield. He performed aerobatics at air shows at Skopje (28 May 1934) and Niš (17 September 1933 and 16 September 1934).

D.9 №4 was lost on 2 August 1931 at Zemun and pilot *ppor* Alojz Kalšek died. Aircraft №2 was destroyed on 6 November 1934 at Zemun airfield, when pilot *kap* Leonid Bajdak bailed out.

In mid-1936 the Fighter Pilot School had four D.9s (№1, 3, 5, 6) and all were listed on 1 June 1936 in VV overview of single-seat aircraft intended for manoeuvres. Some examples still flew aerobatics during the spring of 1937 at Zemun airfield. In a logbook belonging to *kap* IIk Adum Romeo, multiple flights were logged in Dewoitine aircraft of all three types (D.1, D.9 and D.27) during February, April and May 1937. He performed mostly aerobatics with each flight listing the exact type. All flights were made from Zemun airfield and verified by a stamp from 6.VP. On 1 January 1938, VV had total of four D.9s, one operational and three inoperable machines.

Later in service the original French Jupiter engines were replaced with domestic-built engines of the same type. Following an order by the VV Commander on 13 September 1938 for the removal of all



High ranking VV officers posing in front of a D.9 C1: (from left to right) ppuk Živorad Petrović 1.VP CO, brig djen Dušan Simović, ppuk Milojko Janković and kap Ika Šebaljin. This photo was taken most probably during the first half of 1927. (Milan Micevski)

D.9-Jupiter aircraft from active service, they were relocated to 6.VTP (*Ваздухопловно-технички парк* – Air Technical Park).

D.9 had a larger wing span and surface and was heavier and somewhat slower than its predecessor, the D.1. The most obvious external difference was the radial engine with exposed cylinders and larger wing span. Its original purpose was as a fighter (combat aircraft) and it was later used as a training aircraft. In the winter months it was equipped with skis.

The original power plant consisted of a French Gnôme-Rhône Jupiter 9Ab (Jupiter IV) radial which was rated at 420 mhp at 1,700 rpm. The Jupiter engine was originally developed by the British Cosmos company (later taken over by Bristol), while Gnôme-Rhône purchased the licence rights in 1922 (in later periods other manufacturers followed suit). During the later period of use, Yugoslav D.9s were equipped with the Yugoslav derivatives, that is the IAM-built Jupiter 9Ad radials.

Standard weapons were two synchronized 7.7 mm Vickers machine guns with 400 rounds per gun. In VV service, D.9s was often used with only the starboard machine gun, with 350 rounds. After the introduction of the new 7.7 mm M.30 (Darne) machine gun as a standard VV weapon, D.9s carried one with 500 rounds.

6.VP pilot Ilija Ika Zelenika, who flew all Dewoitine types, alleged in his memoirs that the D.9 did not perform aerobatics as well as the D.27 and that it was a somewhat sluggish.

## Camouflage and markings

### Designation

The original designation Dewoitine D.9 C1 (Dewoitine 9 Chasseur 1) was used officially in the Kingdom, but it was written in Cyrillic as *Девоатин Д9 Ц1*. Other designations used in various documents were shortened versions like *Д9* (D9) or *Д.9* (D.9) and engine versions *Девоатин-Јупитер* (Dewoitine-Jupiter) and *Д.9-Јунипер* (D.9-Jupiter).

### Serial numbers

In accordance with the new serial number rule for V KSKS aircraft, D.9 fighters were marked with №1 to №6.

Maj Miodrag Tomić, 6.VP CO, in full flight suit posing in front of his D.9 C1 at "Belgrade aerodrome", 1928. (Miodrag Tomić via authors)



### National insignia

D.9 fighters carried standard “Kosovo cross” insignia at four wing positions and a large flag across the entire rudder.

### Inscriptions and special markings

The following inscriptions were applied across the flag on the rudder: cyrillic aircraft designation (ДЕВОАТИН Д9 Ц1) and serial number (as №) in two columns on the Blue field and aircraft weights in four columns on the White field, and sometimes two columns on the White and two on the Red field. On the side of the fuselage, there was a serial number (№), usually twice as tall as the number on the rudder. According to the standard, next to the lifting port, there was an arrow and Cyrillic inscription ДИЖИ ОВДЕ (lift here), although this was not present on all machines during certain periods. Some machines had a large White code number on the vertical stabilizer.

### Painting Scheme

During their entire service in V KSHS and VV, D.9 fighters carried a specific colour scheme. Metal surfaces were polished Aluminium and fabric on the wings, horizontal stabilizer and all rudders and ailerons were painted Green.

### Aircraft Characteristics\* Dewoitine D.9 C1 (VV Dewoitine-Jupiter)

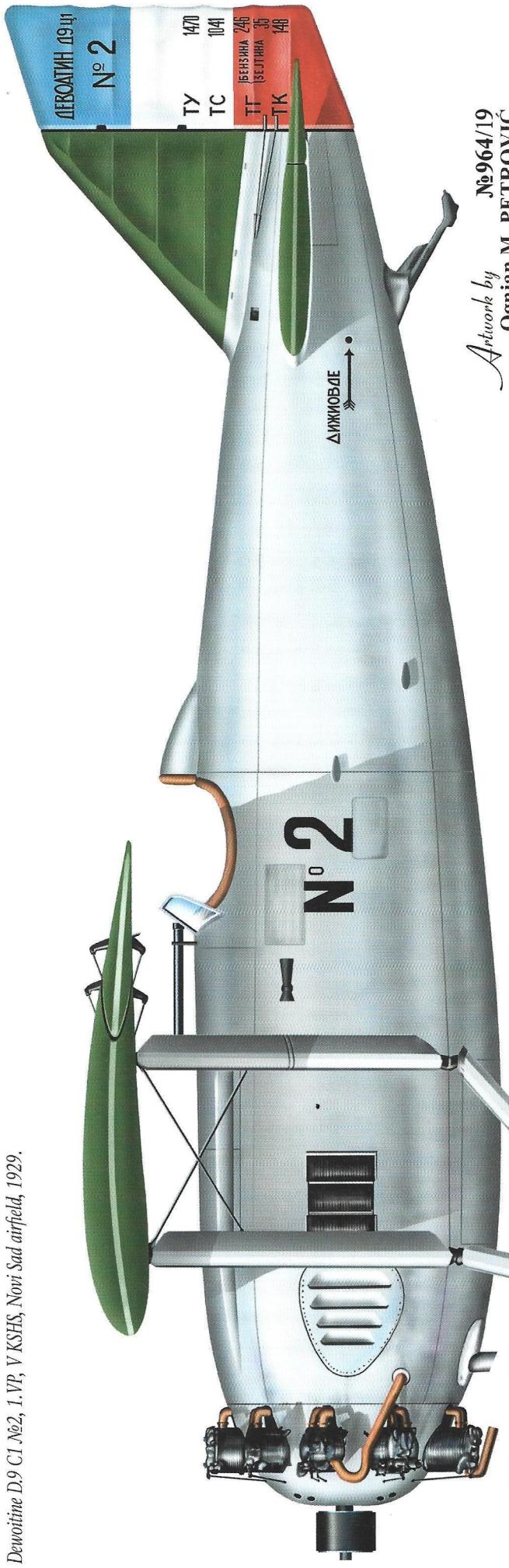
Quantity used:	6
Crew:	1
Years of Service:	1926-1938
Span:	12.2 m (40.2 ft)
Length:	7.3 m (23.9 ft)
Height:	3.0 m (9.8 ft)
Wing area:	25.0 m <sup>2</sup> (269 ft <sup>2</sup> )
Engine:	One 420 mhp Gnôme-Rhône Jupiter 9Ab (Jupiter IV) radial
Empty weight:	1,041 kg (2,295 lb)
Loaded weight:	1,470 kg (3,241 lb)
Maximum speed:	244 km/h (152 mph) at sea level
Service ceiling:	8,500 m (27,877 ft)
Climb to 6.500 m	23 min 28 s
Endurance:	2 h
Armament:	Two synchronized 7.69 mm Vickers M.1909 machine guns

\* Performance during D.9-01 prototype testing in France in May 1925, weights according to inscriptions on the aircraft. Domestic literature for production aircraft lists somewhat different numbers: maximum speed of 213 km/h (132.4 mph), climb time to 6,000 m (19,685 ft) as 25 min 0 sec and the endurance of 2 h 30 min.

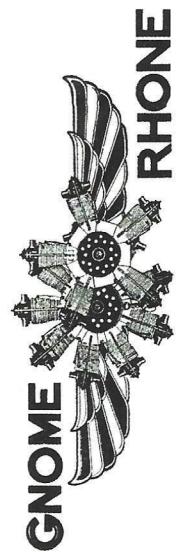
With engine running №5 is prepared for a flight from Novi Sad during the King's Trophy air race. The scene shows very busy ground personnel, the soldier in the front is pulling an oxygen cylinder on a cart. Note the White competition number 5 inboard to the “Kosovo Cross” insignia below the port wing. (Šime Oštrić via Ognjan Petrović)



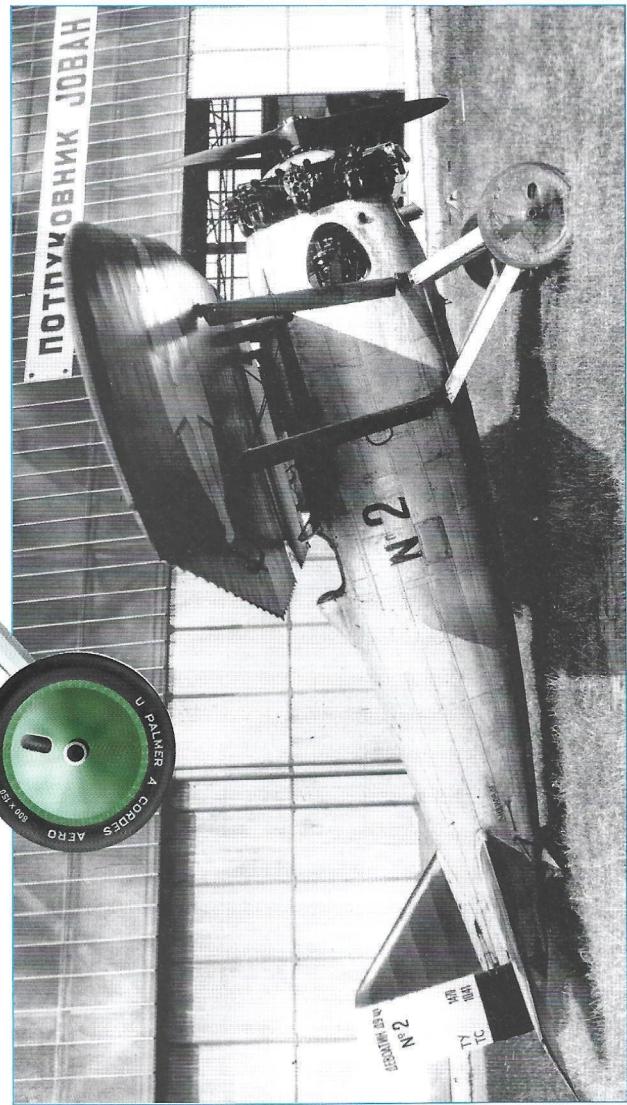
Dewoitine D.9 C1 №2, 1. VP, VKSHS, Novi Sad airfield, 1929.



Artwork by №964/19  
Ognjan M. PETROVIĆ



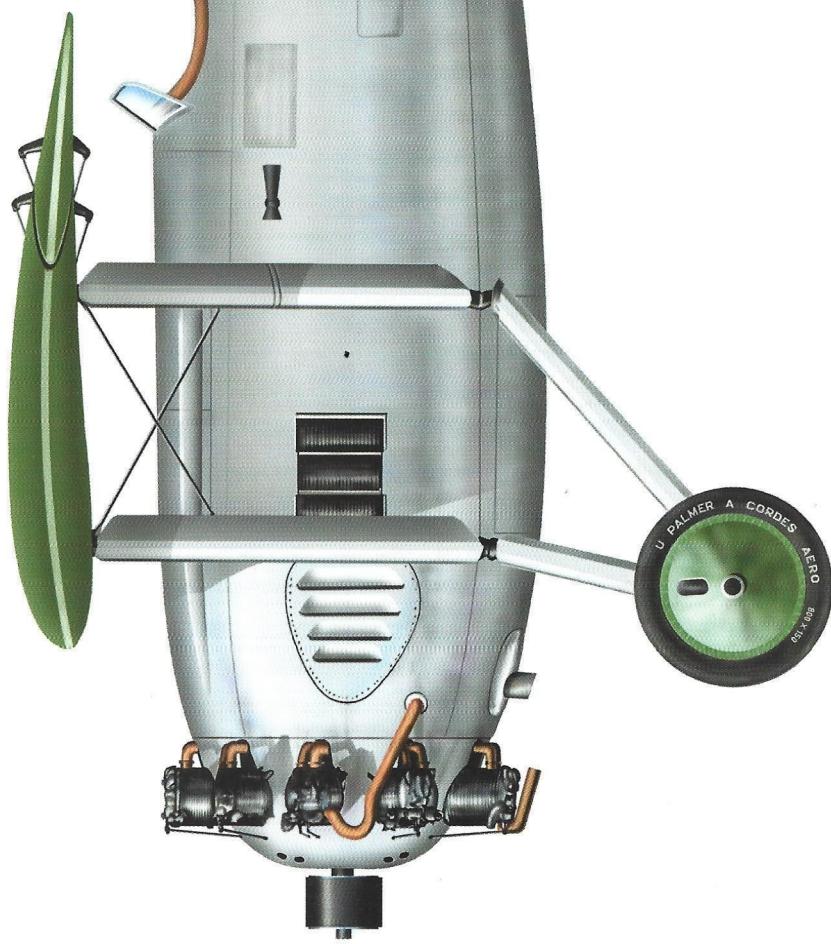
D.9 C1 №2 in front of the hangar at Novi Sad airfield, 1929. The original standardized inscriptions on the nudder and fuselage were applied on this machine. The metal panels are in colour of polished aluminum and all fabric covered surfaces, including wheel spats, are painted glossy Dark Green. Note the absence of bracing wires between the struts and the gun sight at the time. (Janko Dobrnjak family via Pretrug Milatović)



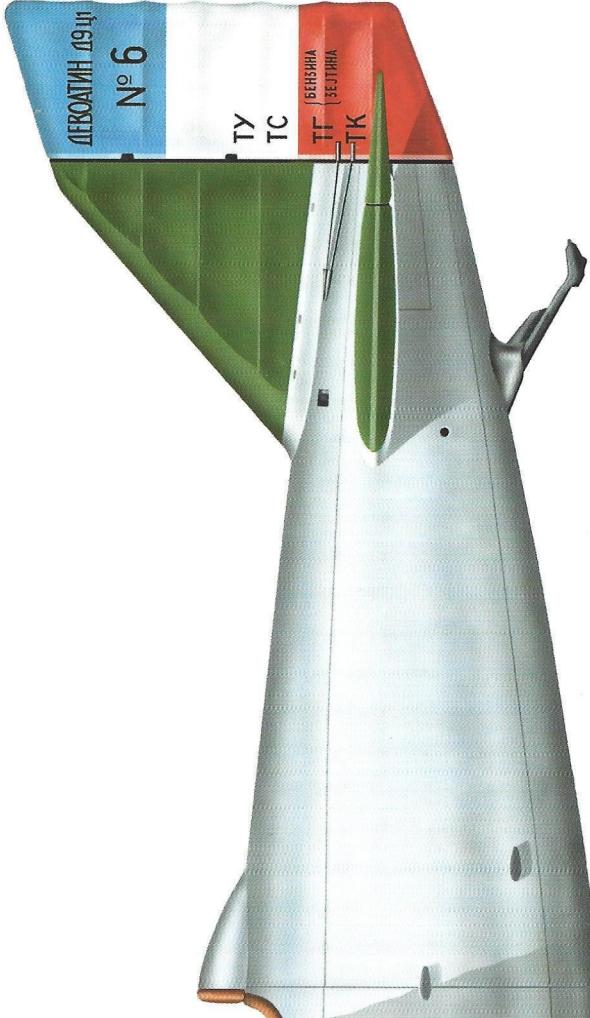
# AVIONS DE WOITINE

*Avions Dewoitine title advertisement.*

Dewoitine D.9 C1 №6, 1.VP, V KSHS, Novi Sad airfield, 1929.

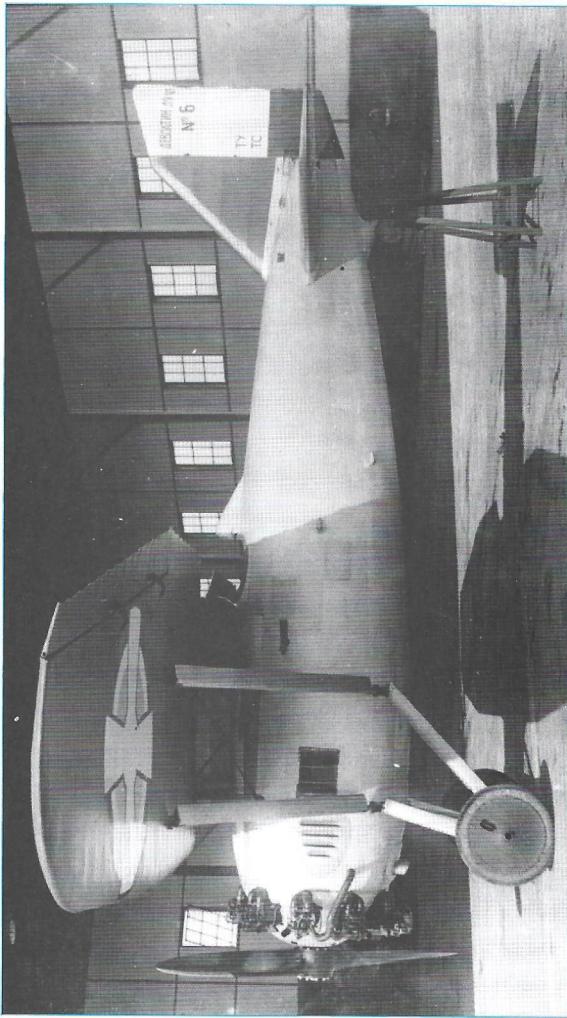


Upper view of port wing. 160 cm "Kosovo cross" is applied on four wing positions.

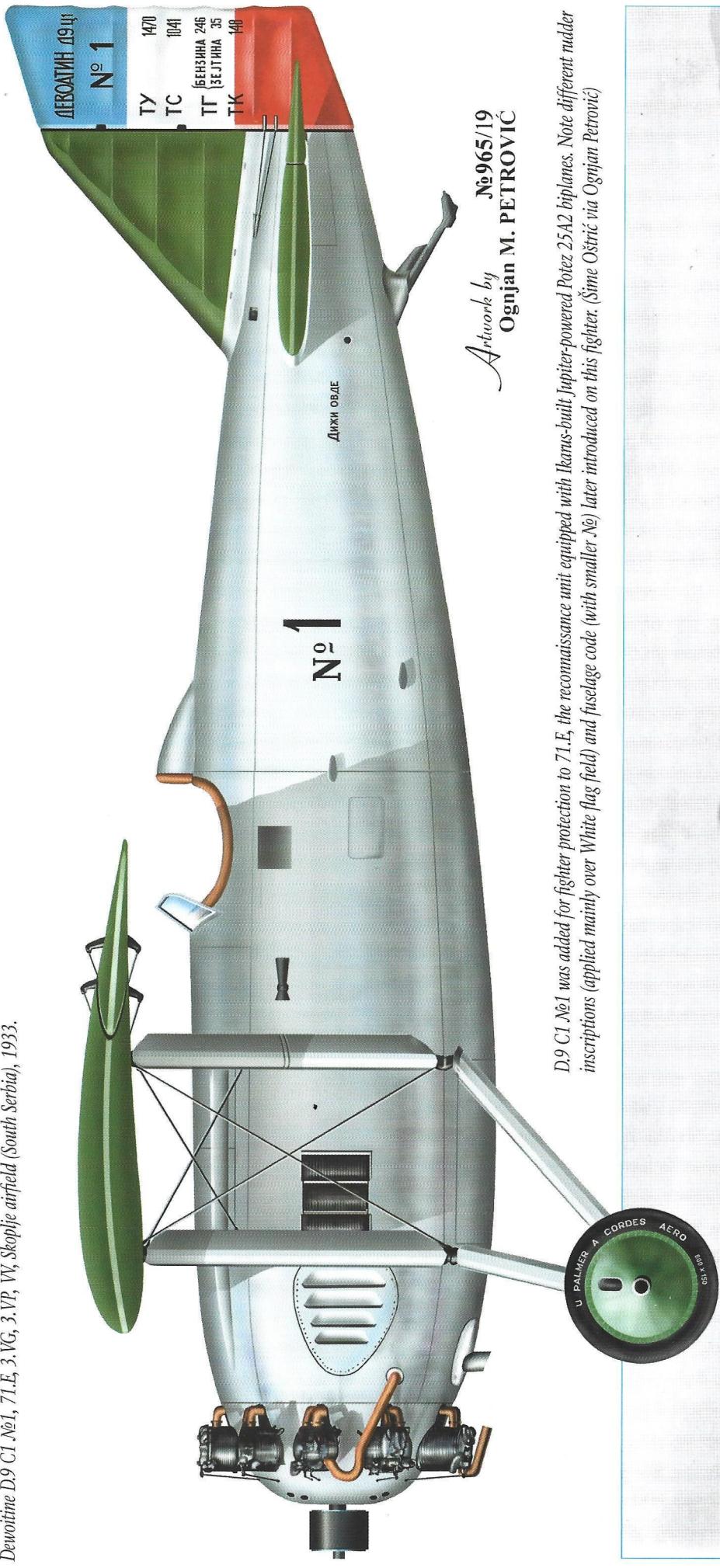


Artwork by  
№963/19  
Ognjan M. PETROVIC

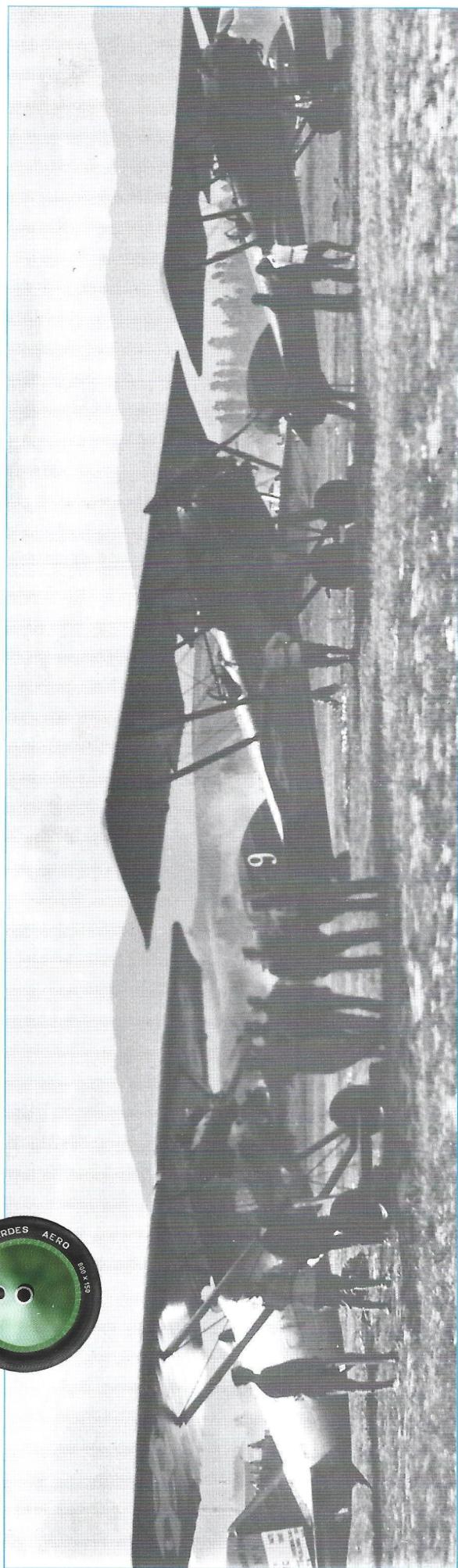
This photo was taken probably after overhaul in 1929 at 1.VP Aeroplane Workshop at Novi Sad. Note that the weights are still not written on the rudder and the aircraft lacks №6 on the fuselage. Interplane bracing wires are lacking on this machine. (Sime Ostric via Ognjan Petrovic)



Dewoitine D.9 C1 №1, 71.E, 3.VG, 3.VP, VII Skopje airfield (South Serbia), 1933.



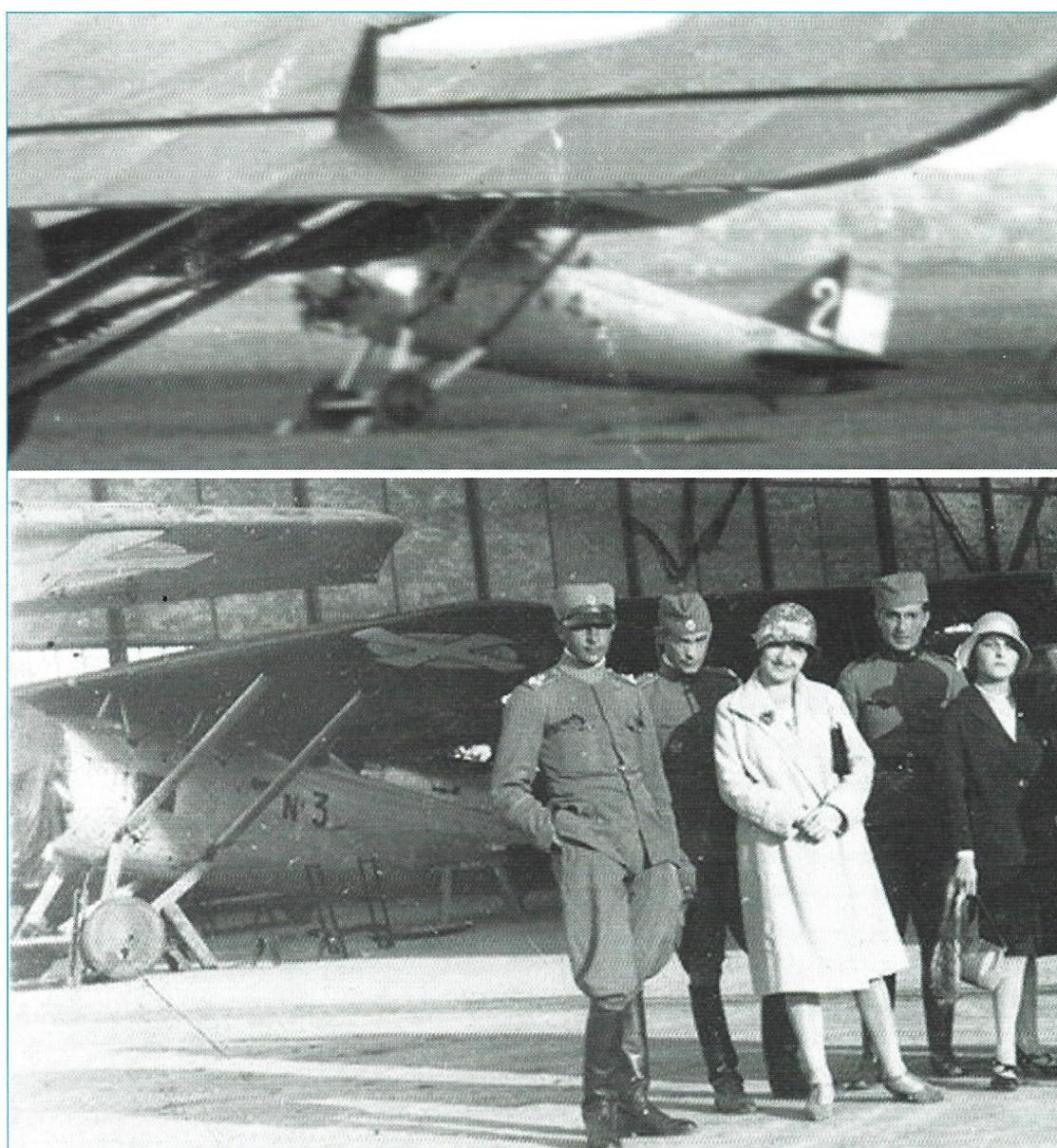
D.9 C1 №1 was added for fighter protection to 71.E, the reconnaissance unit equipped with Ikanus-built Jupiter-powered Potez 25A2 biplanes. Note different nudder inscriptions (applied mainly over White flag field) and fuselage code (with smaller №) later introduced on this fighter. (Sime Oštrić via Ognjan Petrović)



Famous aerobatic VV pilots of the period (from left to right): por Milan Bjelanović, por Franjo Džal, por Miodrag Blagojević and nar Rade Samolov. Here, they are posing in front of D.9 C1 №2 at Zagreb airfield on 4 June 1933 at the National aviation rally. (Milan Micevski)



Two shots of D.9 C1: (top) №4 was lost on 2 August 1931 at Zemun and pilot ppor Alojz Kalšek died. Here the aircraft is pictured prior to that unfortunate event. Note escadrille code "White 2" on the vertical stabilizer; (bottom) №3 parked in the hangar. Officers and their spouses pose in front of the hangar, standing the second from the left is por Siniša Nikolić, VOG CO in 1941. (Šime Oštrić via Ognjan Petrović)



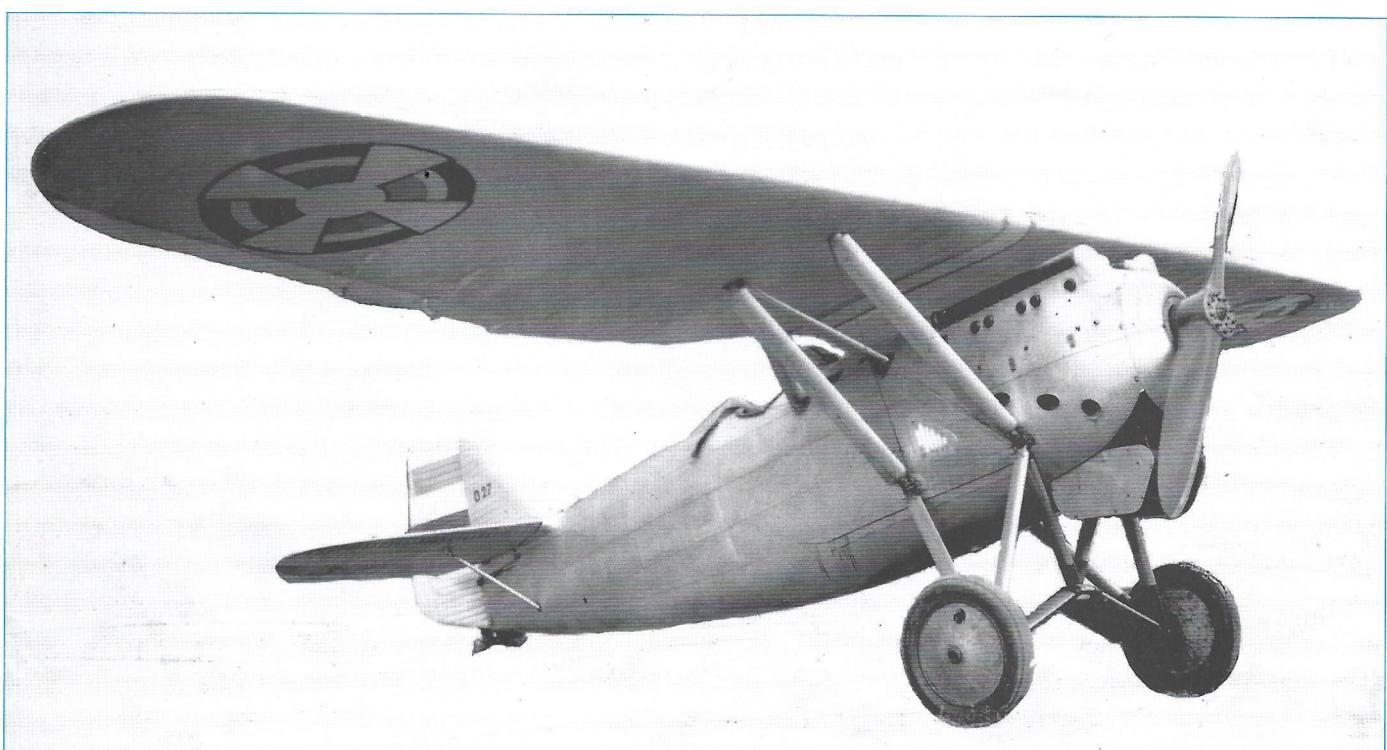
# Dewoitine D.27 C1 Jockey (VV Dewoitine-Hispano 500 KS)

## Background

In the mid twenties in France, an idea surfaced to replace the current slow and heavy fighters with light aircraft which would maximally exploit the power of available engines. As a result, a new class of lightweight single-seat fighters (*C1 léger*) emerged in 1926 with minimum mass and weapons, unofficially known as the “Jockey” program. The main rivals in this class were the Morane-Saulnier 221 C1, Dewoitine 27 C1, Bernard 20 C1 and Wibault 210 C1.

Following the liquidation of his company CAED in France during January 1927, Dewoitine moved to Switzerland where, during the summer of the same year, he completed a study for a second-generation parasol fighter labelled as D.27. Basically, the new type was an optimization of the first Dewoitine project, the D.1 (aerodynamically redesigned, with new independent landing gear legs and more powerful engine) and it was the first of the so called “Second generation” Dewoitine parasols. In March 1928 Dewoitine founded a new company, SAF-AD (Société Aéronautique Française-Avions Dewoitine), which immediately published the characteristics of the future fighter. Project team consisted of engineers Marcel Tourret and Jean Brouard, associates from the previous Dewoitine bureau at Chatillon-sous-Bagneux. The workshop documentation was produced with the help of the Swiss factory EKW (Eidgenössische Konstruktions Werkstätte) from Thun (Thoune), in the canton of Bern. That factory produced the first prototype and the first flight took place on 3 June 1928 at Dübendorf, with pilot Marcel Doret. The prototype was displayed with Swiss markings at the SAF-AD stand at the 11<sup>th</sup> Aeronautical Exhibition in Paris, held from 29 June to 15 July 1928. The new aircraft caught a lot of attention from foreign buyers, and the Yugoslav authorities requested a demonstration of the type in the country. The price of one aircraft in September 1928 was 84,970 French francs.

D.27 prototype with Yugoslav insignias. Note that the photograph was manually altered as visible by the background which was deleted and the edges of the aircraft which are rough and appear damaged. (Šime Oštrić)



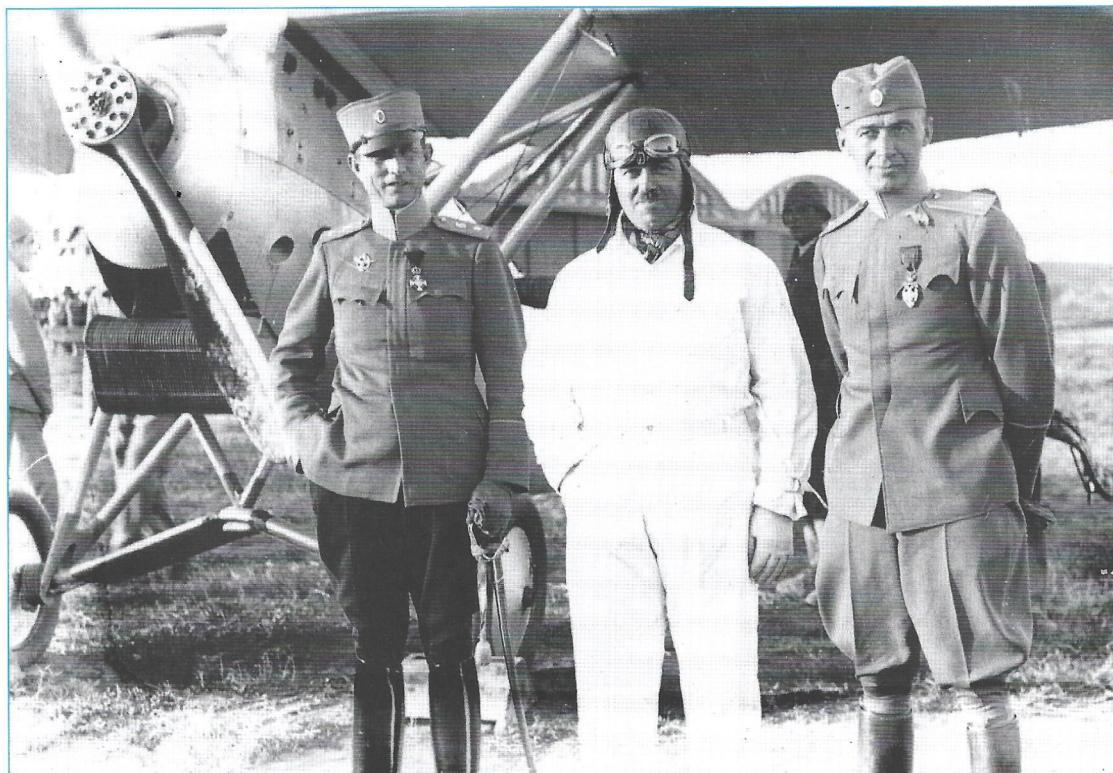
*Members of the Air Force and the Military commission pictured during demonstration of D.27 prototype at Novi Sad in October 1928. Note the owner of SAF-AD and designer Emile Dewoitine (second from the right in first row), Division General Radisav Stanojlović W C-in-C (the third), test pilot and acrobat, "king of the skies" Marcel Doret (the fourth) and Brigade General Dušan Simović, WV deputy of C-in-C (the fifth). (Miodrag Tomic family via authors)*



*A fine low-level fly by D.27 prototype at Novi Sad airfield. On the right, just started construction on the hangars is visible. (Aleksandar Milošević)*



*Three extraordinary pilots posed for a remembrance shot in front of D.27 prototype at Novi Sad airfield, October 1928: (from left to right) maj Miodrag Tomic 6. VP CO, Frenchman Marcel Doret and maj Teodor Uzelac. (Aleksandar Milošević)*





Around 40 foreign pilots tested Dewoitine's new aircraft towards the end of 1928 and at the same time EKW began work on small pre-series. The pre-series aircraft received a new vertical tail, and the decision to adopt this change was made following a report from 23 January 1929 which came as a result of wind tunnel testing of a 1:10 scale model at *Laboratoire Eiffel*. The first three aircraft were handed over in April 1929 to SAF. Aircraft №1, marked with CH 138, remained in Switzerland and two were transferred to France. Romania received three aircraft, KJ purchased one aircraft, the licence and certain parts to produce three machines, while Argentina gave up the purchase of one aircraft on order in spite of purchasing the licence. Apart from the Swiss pre-series, the French factory LeO (*Établissements Lioré-et-Olivier*) produced a small series of seven aircraft for SAF which were used for trials and experiments with various engines. The Swiss Air Force (*Schweizerische Fliegertruppe*) took charge of the prototype (s/n 200) and adopted the type D.27. EKW produced between 1931 and 1932 65 more D.27 IIIIs (s/nos 201-265). In the meantime, the Swiss prototype received a new rounded tail in 1929.

*The second prototype D.27 remained in the Kingdom of Yugoslavia. This machine had a characteristic trapezoidal vertical tail shape. Note the Yugoslav state flag applied on the upper half of rudder and aircraft type (D 27) on the vertical stabilizer. (Janko Dobnikar family via Predrag Miladinovic)*

## Service in the Kingdom of Yugoslavia

Based on the afore-mentioned request by the Kingdom, the EKW-built second D.27 prototype and two lead people from SAF-AD, the owner and designer Emile Dewoitine and test pilot and acrobat, "king of the skies" Marcel Doret, arrived in October 1928 at Novi Sad. The French pilot conducted on 23 October a series of aerobatic flights over Novi Sad in front of the Military commission and foreign attachés. Five days later, on 28 October, Doret flew from the Zemun airfield as well and the aircraft was tested by *kap* Janko Markićević. Émile Dewoitine reported to the Politika journalist that "*he produced only two aircraft of this new type and that one he sent to Yugoslavia and the other to Switzerland.*" According to the contemporary French standard these two D.27 prototypes were described as "17 m<sup>2</sup> wing area" (the first, Swiss machine) and "18 m<sup>2</sup> wing area" (the second, Yugoslav example). Both prototypes had a characteristic trapezoidal vertical stabilizer shape, while the Yugoslav machine had a large tab added along the entire trailing edge of the rudder. The second prototype remained in KJ and in November 1928 it was tested at Novi Sad in parallel with the Czechoslovak Avia BH-33E fighter.

After the comparative testing of the D.27 and BH-33E fighters, V KSHS placed an order for both types to compete in the Third *Petite Entente* and Poland race in 1929 (*3e Circuit de la Petite Entente pour avions de chasse*). While three Avia BH-33Es were purchased from the Czechoslovak manufacturer, for D.27 the licence was purchased and a contract was signed between SAF-AD and Zmaj factories for four machines (more precisely, one existing pattern machine and three licence-built). In the period between May and June 1929 Zmaj received the majority of the material on order from abroad which was needed to produce D.27. The first completed licence-built machine, №2, was delivered in July 1929 and on *Свети Илија* (Saint Prophet Elias) Day, 2 August, the official hand-over to 6.VP took place. The magazine *Наша крила* (Our Wings) no 63/1929 published the news that "*the company owners Petrović and Šterić (i.e. Zmaj) handed over to the Minister, general Hadžić, the aircraft type which flew last year at the controls of "the king of the skies" Doret*". Three D.27 fighters, together with three BH-33Es, took part between 6 and 9 September 1929 in the race in Bucharest, but without success. *Maj* Dušan Radović flew prototype



*Another view of the second prototype, which was tested in parallel with Avia BH-33E at Novi Sad airfield. Note the large "Kosovo cross" applied on wings, with diameter of  $\frac{3}{4}$  wing chord (Milos Milosavljevic)*

Nº1a (competition number "Black 1"), while *maj* Miroslav Navratil and *kap* Dragutin Rupčić piloted Zmaj-built machines ("Black 17" and "Black 16" respectively).

Compared to the prototype, the licence-built D.27 had a somewhat shorter wing span and a rounded vertical tail. The Zmaj factory produced D.27 airframes using its own parts and those imported from Switzerland. Assistance was provided by two Dewoitine instructors, who left the country after a year. D.27 series production did not proceed further because the Avia BH-33E was adopted as the standard V KSHS fighter type.

During the next few years, the D.27s served mostly for air shows. For example, at the aeronautical festivities in Zagreb on 4 June 1933, pilot *ppor* Milan Bjelanović performed a dogfight with a single-seat D.27 against a two-seat Jupiter-powered Potez 25. The same pilot performed very successful aerobatics at low altitude while flying the same aircraft. The last known traces of service in VV are available for the period of February to May 1937, with aerobatic flights by a D.27 recorded at 6.VP at Zemun airfield. At the same airfield the following service details for the D.27 are known: three aircraft flew in 1934, at least two (Nº2 and Nº3) within 125.VG in 1936, between February to May 1937 aerobatics were performed and the last time two D.27s were mentioned was in 1938. On 1 January 1938, three unserviceable D.27s were listed in VV service. Service was intended to cease at the end of 1938, while wartime use was not planned. Aircraft repairs were performed at Zmaj. In accordance with the VV CO's order from 13 September 1938, all remaining D.27-Hispano 500 KS (including the engines) were struck off charge and sent to 6.VTP.

The D.27 fighter was powered by a new engine which was first showcased at the Paris Exhibition in 1928. This engine was the water-cooled V-12 Vee-60 Hispano-Suiza 12Mb (factory designation HS Type 57) without supercharger. The engine had a nominal power rating of 500 mhp at 2,000 rpm and maximum power of 580 mhp at 2,100 rpm. The weapons comprised of two synchronized 7.7 mm M.30 (Darne 1930) machine guns with 500 rounds per gun, the newly-introduced standardized weapon of



*This view of prototype shows the 500 mhp Hispano-Suiza 12Mb and a large radiator below the nose. (Čedomir Janić)*



Por Aleksa Marinović accompanied by four ladies posing in front of the prototype at Novi Sad. Note that this point in time the wings have been painted while the aircraft type and s/n on vertical stabilizer disappeared. The date when photo was taken remains unknown, we can assume that it was after the 1929 Petite Entente and Poland air race. (Šime Oštric)

the VV. Gun sight was a French *Colimateur* type. The D.27 was equipped with a fire extinguisher and, optionally, a vertical camera in the aft fuselage.

The aircraft was characterized as smaller, more appealing and with better flight characteristics than other Dewoitines, excellent for aerobatics, with a powerful and loud engine which “roared”. 6.VP pilot Ilija “Ika” Zelenika, said in his memoirs that the Jockey was better for aerobatics than the D.9. But it was difficult to fly (controls were heavy) at full throttle and as a result it was not recommended for service following the comparison testing with the Avia BH-33E, in spite of being faster and climbing better, while the BH-33E had a better turn radius. The D.27 was only suitable for the most expert pilots.

According to the accounts of experienced pilots who flew the D.27 the most (majors Sergej Šebaljin and France Pirc, lieutenants Albin Vesel and Djordje Karakušević), the type had very hard controls in flight and it was not easy to control. It had a tendency to enter a chandelle, to the extent that an average strength pilot could not hold it even for a minute at full power in horizontal flight, even if the movable horizontal stabilizer was placed in the diving position.

In the Commission report by the 6.VP's Technical Park CO from 7 May 1934, interesting remarks were given following the inspection of Dewoitine D.27 №1, №2 and №3 and their engines. The Commission was of the opinion that the afore-mentioned tendency might be resolved by gradually reworking the struts to obtain a favourable wing incidence (to reduce the angle of attack), as was previously done on №1. According to the accounts by *maj* Šebaljin and *maj* Pirc, after the modifications the aircraft showed good flying characteristics. All improvements could be implemented at 6.VP's AR TP (*Аеропланска радионица Техничког парка* – Aeroplane Workshop of Technical Park).

*Ваздухопловни гласник* (Aviation Herald) no 3/1933 magazine published an interesting news article that the Yugoslav competitors at the meet in Zürich concluded that the Swiss Dewoitine D.27 was able to achieve a maximum speed of 320 km/h, while the Yugoslav D.27 with the same engine, in the same conditions, was only capable of 290 km/h.

As a non-standard type, the D.27 left its mark in VV as a modern fighter at the end of the twenties which served for training of experienced pilots. Of more importance was the purchase of the licence which enabled the Zmaj factory to become familiar with and to introduce modern French technologies for production of metal structure aircraft.

## Camouflage and markings

### Designations

In accordance with the French name Dewoitine D.27 C1 Jockey, the type was known in VV as *Д.27* (D.27) or *Девоатин Д.27 Џокеј* (Dewoitine D.27 Jockey) and in accordance with the engine as *Девоатин-Хиспано 500 КС* (Dewoitine-Hispano 500 KS).

### Serial numbers and codes

At the beginning the prototype did not carry a s/n and in the later period below the aircraft designation (D 27) a s/n (Ia) was written with letter “a” in superscript. Some logbooks contained markings for №1a. A flight with such aircraft was recorded in August 1930 by pilot Janko Markičević and in November 1931 by pilot Mihajlo Akrit. The unusual and non-standard s/n №1a indicates this was an exception.

Licence-built aircraft were assigned s/nos №1 to №3. D.27 №4 (escadrille number 82) participated during 1933 at air shows. This fact indicates that the s/n of some VV D.27 aircraft changed during the course of its service. In some periods of service, Black code and competition numbers were applied on the fuselage.

#### Camouflage

Fuselage was in highly-polished natural Aluminium, while the fabric covered wings and tail surfaces were Silver doped. Wings struts remained in bare metal.

#### Markings and inscriptions

The prototype carried standard Yugoslav national insignia, 100 cm diameter “Kosovo cross”, in four wing positions and the state flag on the upper half of the rudder. The “Kosovo cross” did not cross over the ailerons and was slightly different from standard insignia (White cross was slightly larger than the diameter of the Red ring). On the vertical stabilizer, in front of the White flag band, the inscription D 27 was applied.

Three Zmaj-built machines also carried a similar “Kosovo cross” in four wing positions, while the state flag was applied over the entire rudder. Standard VV inscriptions were applied over the flag, aircraft name (Cyrillic Ђ.27) and s/n (№1 to №3) in two rows over the upper Blue flag surfaces, and aircraft weights in four rows marked with Serbian Cyrillic abbreviations *ТV*, *TC*, *TK* and *TT* (*TU*, *TS*, *TK* and *TG*, respectively).

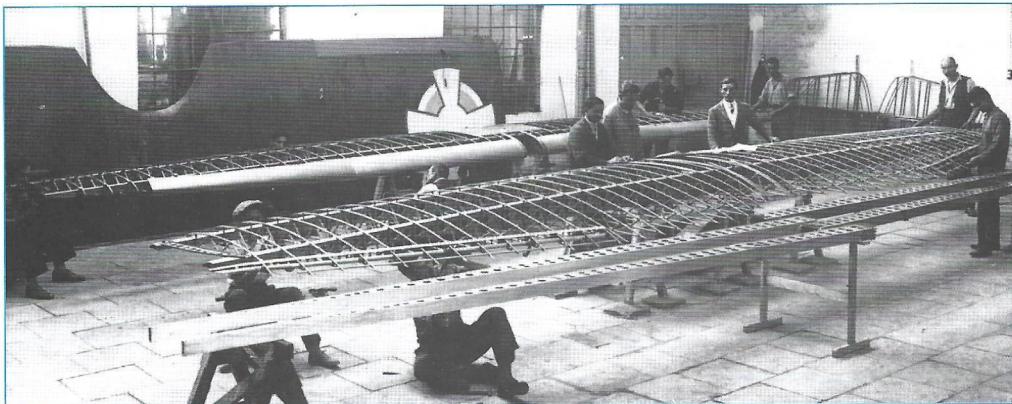
#### Aircraft Characteristics\* EKW-built Dewoitine D.27 C1 second prototype (VV Dewoitine-Hispano 500 KS prototype)

Quantity used:	1
Crew:	1
Years of Service:	1929-1938
Span:	10.3 m (33.8 ft)
Length:	6.6 m (21.5 ft)
Height:	2.8 m (9.1 ft)
Wing area:	17.6 m <sup>2</sup> (189 ft <sup>2</sup> ) i.e. so-called “18 m <sup>2</sup> “
Engine:	One 500 mhp Hispano-Suiza 12Mb
Empty weight:	970 kg (2,138 lb)
Loaded weight:	1,282 kg (2,826 lb)
Maximum speed:	245 km/h (152 mph) at 4,000 m (13,123 ft)
Service ceiling:	9,630 m (31,959 ft)
Climb to 5,000 m	9 min 23 s
Armament:	Two synchronized 7.7 mm M.30 (Darne M.1930)

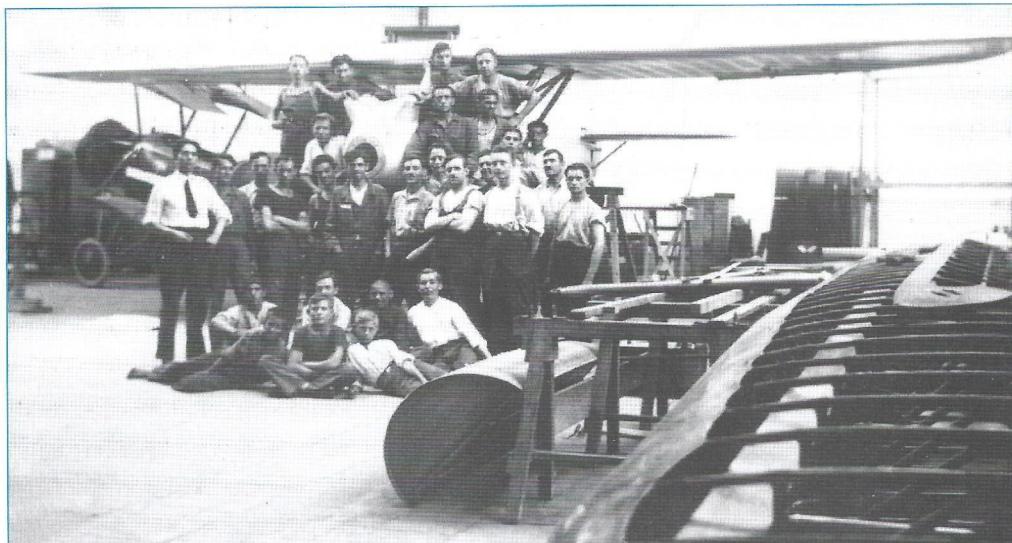
\*Data for the prototype with take-off weight of 1,282 kg was obtained during the comparison testing with the Avia BH-33E conducted in November 1928 by KSHS. Maximum attained speeds at 4,000 and 5,000 m were 245 and 236 km/h respectively.

#### Aircraft Characteristics Zmaj-built Dewoitine D.27 C1 (VV Dewoitine-Hispano 500 KS)

Quantity used:	3
Crew:	1
Years of Service:	1929-1938
Span:	9.8 m (32.1 ft)
Length:	6.5 m (21.3 ft)
Height:	2.8 m (9.2 ft)
Wing area:	17.0 m <sup>2</sup> (183 ft <sup>2</sup> ) i.e. so-called “17 m <sup>2</sup> “
Engine:	One 500 mhp Hispano-Suiza 12Mb
Empty weight:	1,043 kg (2,299 lb)
Loaded weight:	1,384 kg (3,051 lb)
Maximum speed:	310 km/h (193 mph) at sea level 295 km/h (183 mph) at 5,000 m (16,404 ft)
Service ceiling:	9,250 m (30,348 ft)
Climb to 5,000 m	9 min 50 s
Normal range:	1,200 km (746 ml)
Armament:	Two synchronized 7.7 mm M.30 (Darne M.1930)



The license to produce only three D.27 fighters was purchased from SAF-AD and Zmaj Hydroplane and Aeroplane Factory delivered the first machine on 11 July 1929. Shown here is the fabrication of the wing structure. Note the wing assembly of Gourdou-Leseure B3 fighter-trainer which was also license-built by Zmaj. (Milan Micevski)



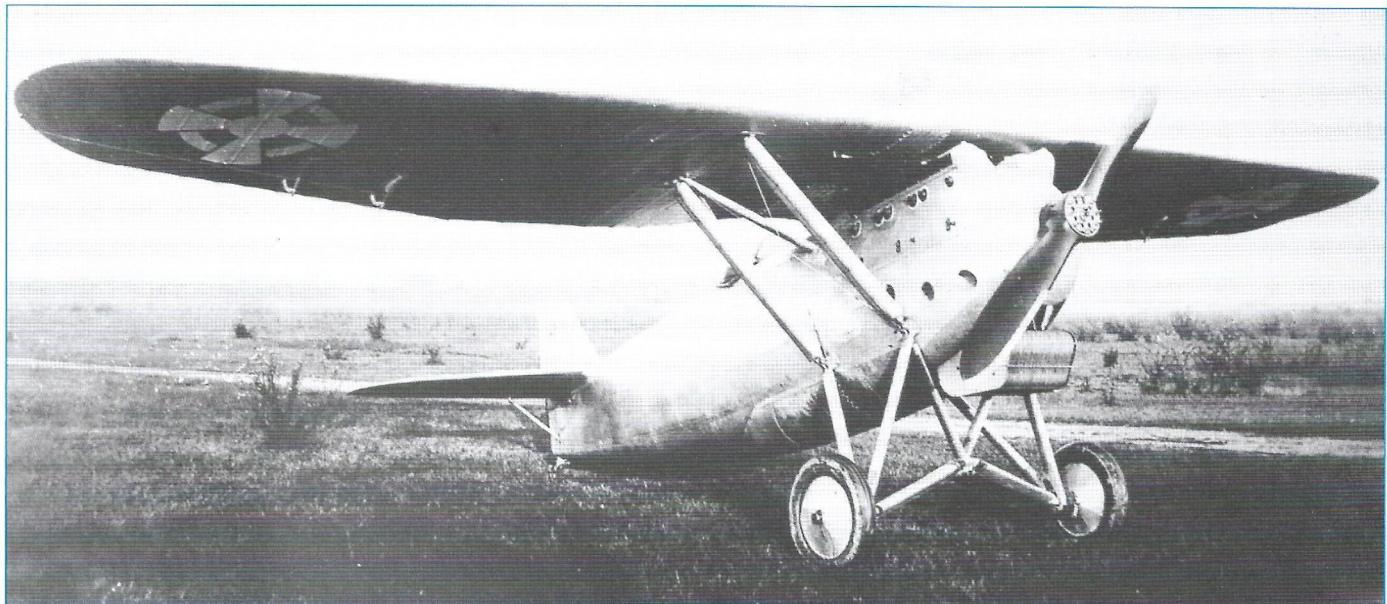
Some of Zmaj personnel and children in front of a D.27 during assembly. An incomplete wing frame is visible on the right. (Milan Micevski)



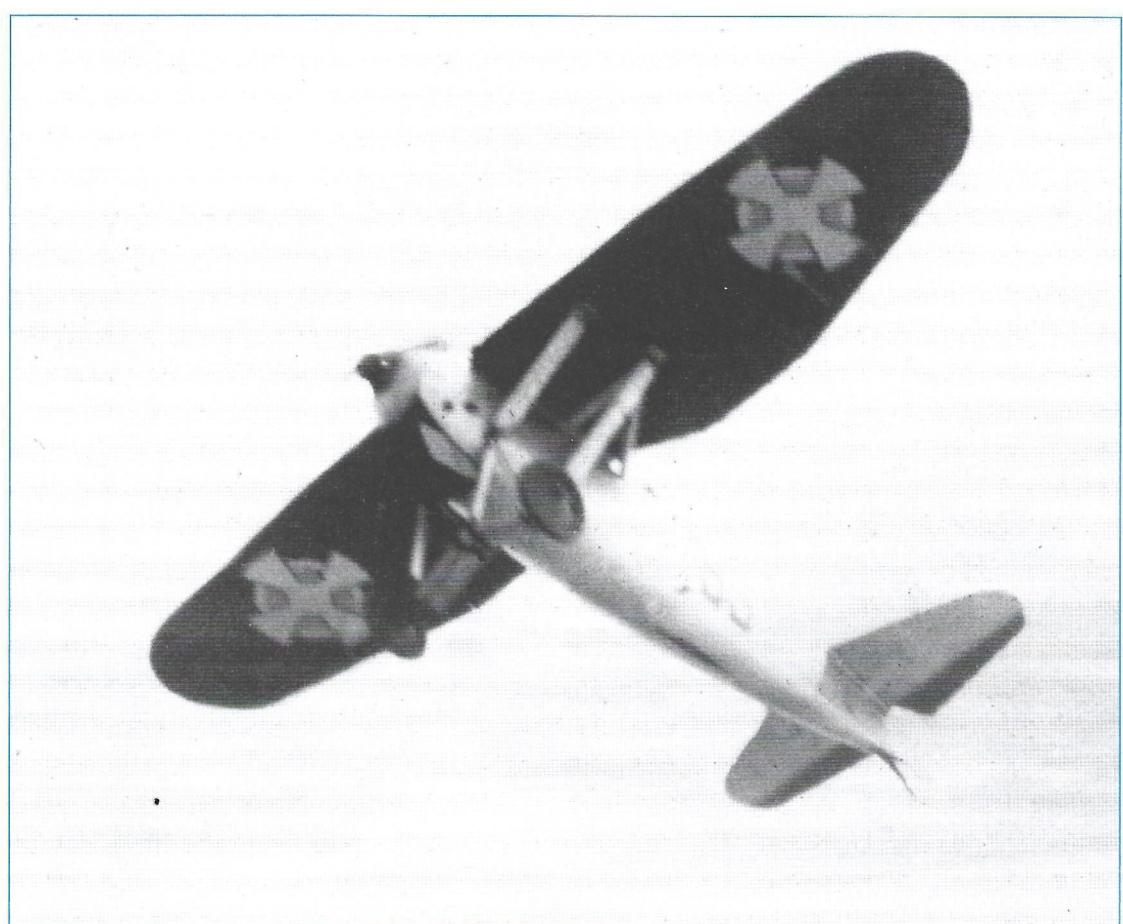
A group of Zmaj workers and technicians, including one of factory's owners Dragoljub Šterić (third one from the left in the standing row, with raised arm) and mechanic Sergije Ta Kup Ja are proudly posing in front of a brand new D.27 C1 №2. (Milan Micevski)



The first delivered, brand new domestically produced D.27 was the №2 seen here. Note the rounded vertical tail and rudder shape compared to the second prototype manufactured by SAF-AD. Early Zmaj factory logo is applied on the vertical stabilizer, standard WV inscriptions on rudder, aircraft type in Cyrillic (Д27) and s/n (№2) on Blue flag field and mass abbreviations (without particular values) on White field. (Milan Micevski)



*This photo was often published in Yugoslav print. Absence of cylinder heads air intakes supports a conclusion that this is №2, the first Zmaj-built machine. (Marko Babić)*



*A very rare shot of VV D.27 in flight. (Aviation Museum – Belgrade via Čedomir Janić)*

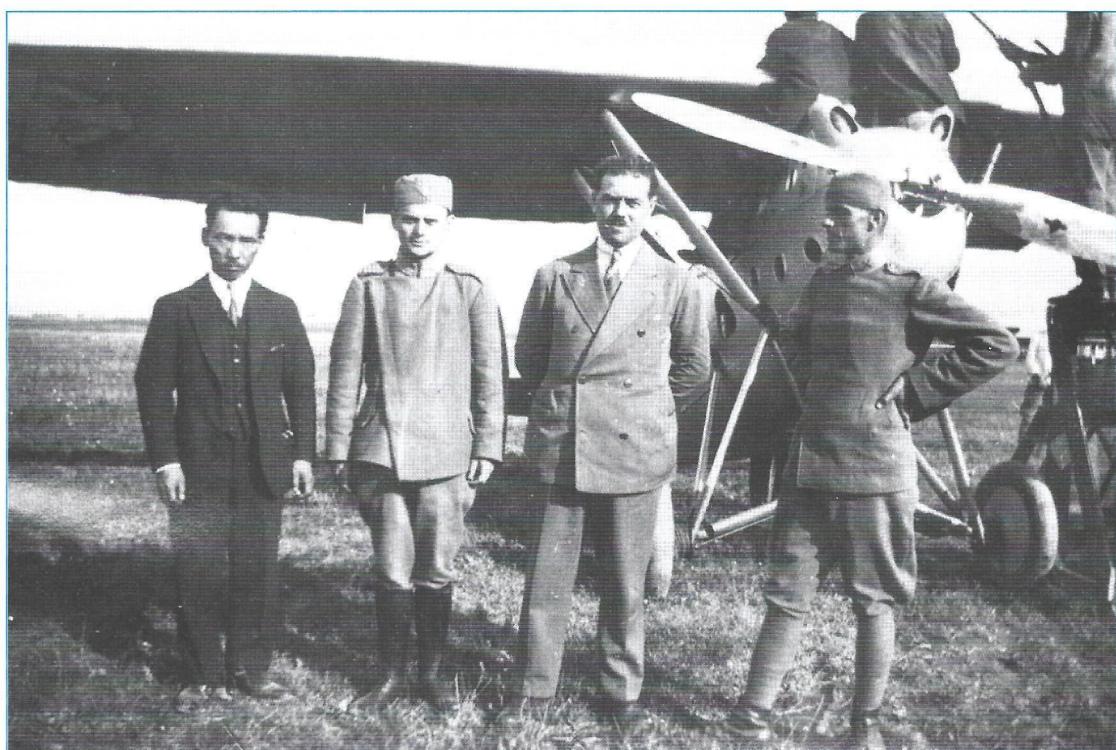


*Three VV ground personnel in front of a D.27 C1 seen at Zemun airfield. Note the tail of Potez 25 "White 3" on the left side of the photo and an unfinished hangar under the port wing of D.27.*

*Aircraft has new elliptical-shaped cylinder heads air intakes on the engine cowling compared to the №2 machine. (Aviation Museum – Belgrade via Čedomir Janić)*



D.27 at Zenun. The man in the middle is pilot por Siniša Nikolić "Glista". According to the standard practice "Kosovo Cross" insignia was carried in four wing positions. (via Boris Ciglić)

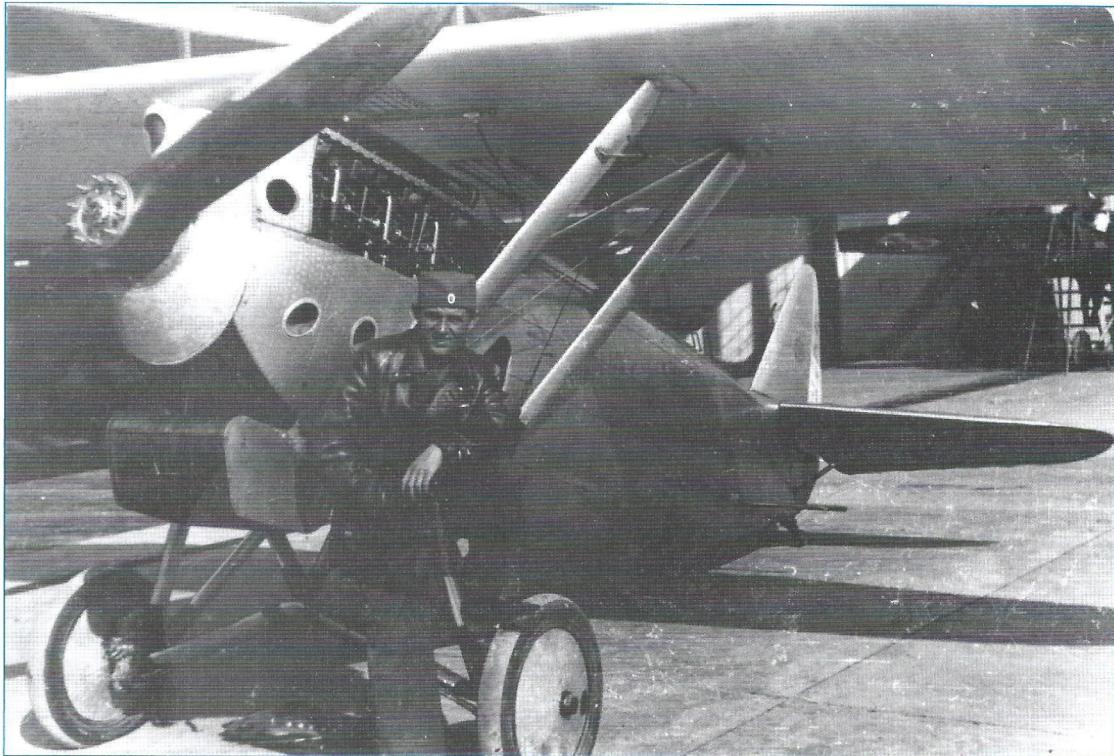


Remembrance shot in front of D.27 fighter: four people, standing first from the left is mechanic Segje Ta Kup Ja. (Tihomir Likso)



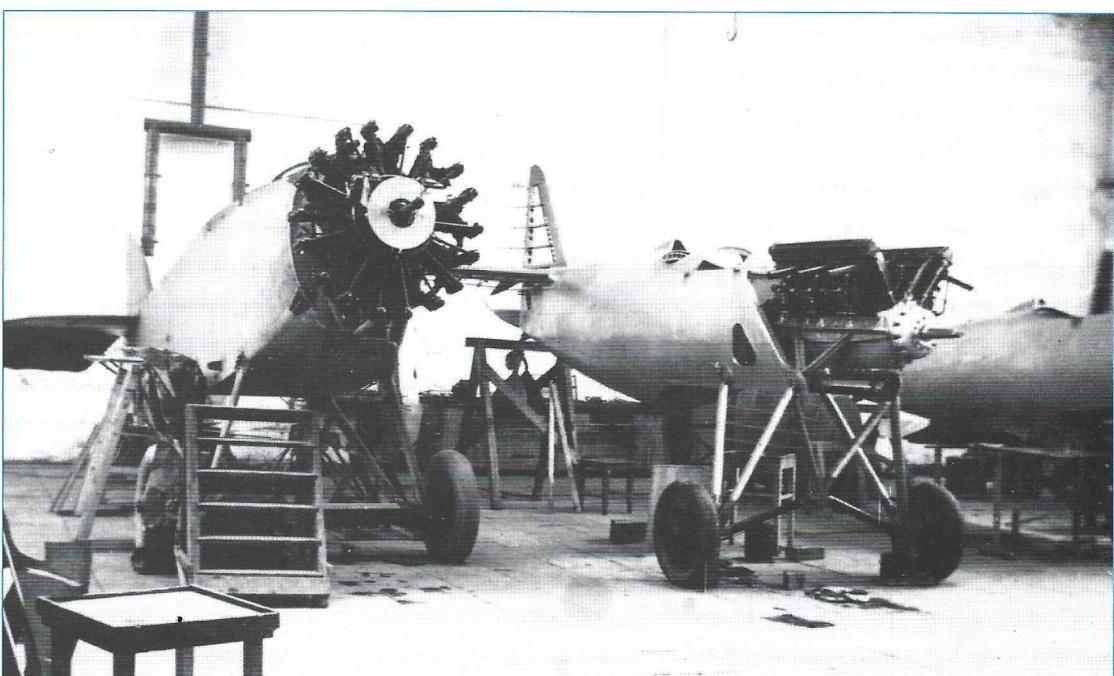
Pilot attendant nar Budimir P. Marinković in front of D.27 whose engine and cockpit were covered with leather cover, 1938. (Miloš Milosavljević)

Remembrance photo: pilot and D.27 in hangar. (Šime Oštrić)



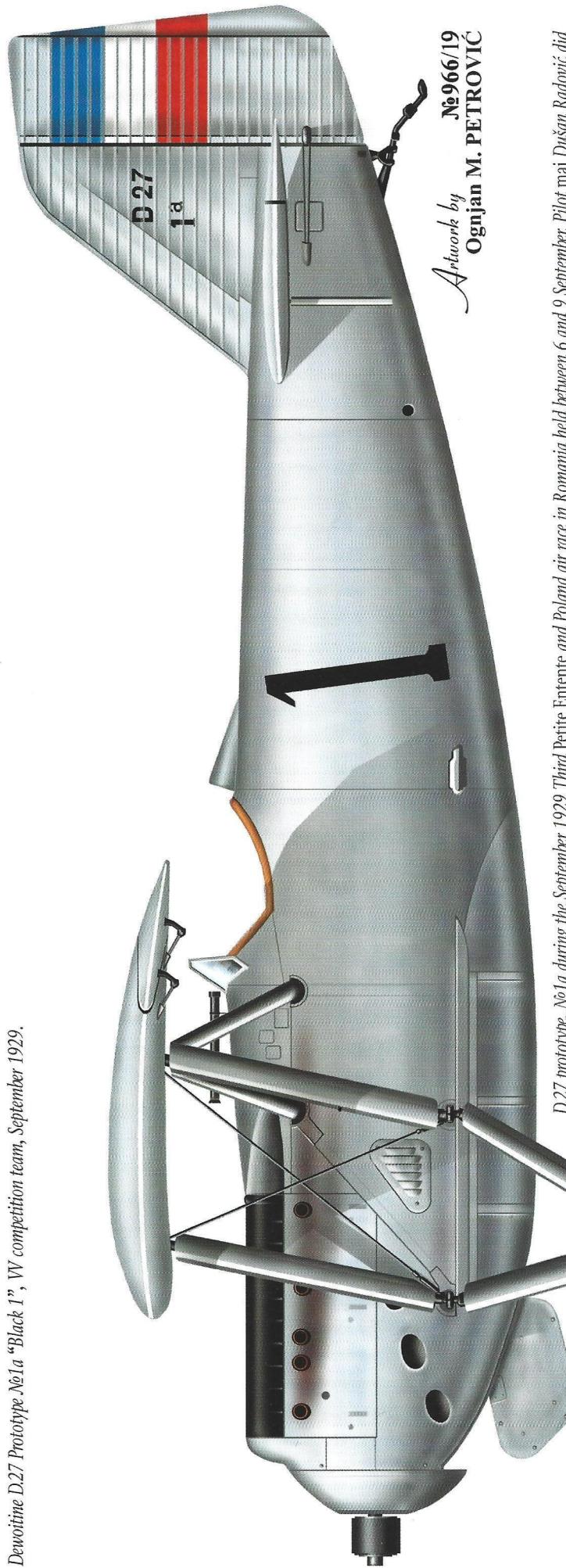
Zmaj factory hall with D.27 undergoing overhaul showing the exposed Hispano-Suiza 12Mb engine.

On the left is indigenously designed, Zmaj-built Физир Ф.1В-Пажм (Fizir F.1V-Wright) equipped with Wright Whirlwind J-5C engine. (Milan Micevski)



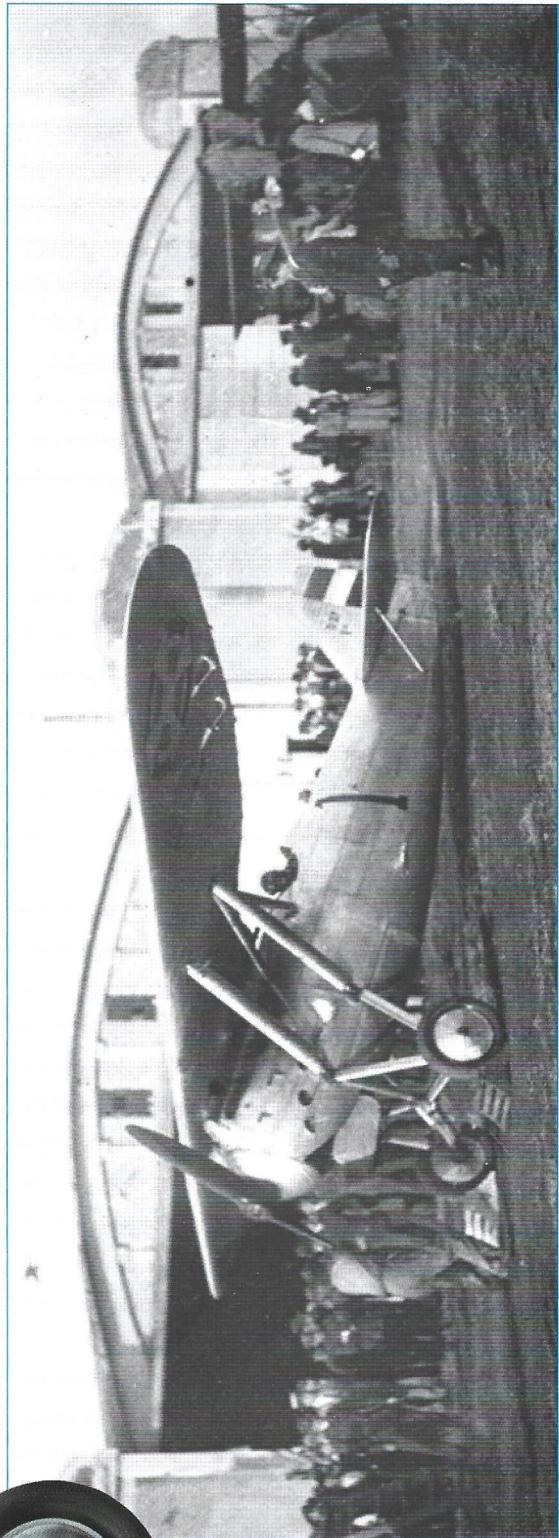
Fine rear three-quarter view of D.27 №2, 6.VP, Belgrade-Zemun airfield, early thirties. Three WV aircraft types are visible in the background (left to right): BH-33E, Potez 25 Jupiter and Dewoitine D.1 №22. Note the absence "0" in the "T.C. 1043". (Robert Čopek)





Dewoitine D.27 Prototype №1a "Black 1", W competition team, September 1929.

D.27 prototype, №1a during the September 1929 Third Petite Entente and Poland air race in Romania held between 6 and 9 September. Pilot maj Dušan Radović did not have a successfull event. Competition numbers ("Black 1") were applied on the fuselage sides and under the wings. Rieslage number was set up in unusual way at an oblique angle compared with the aircraft longitudinal axis. Note the newly applied temporary chn (1a) below the aircraft type. (Dan Antoniu via Predrag Miladinović)



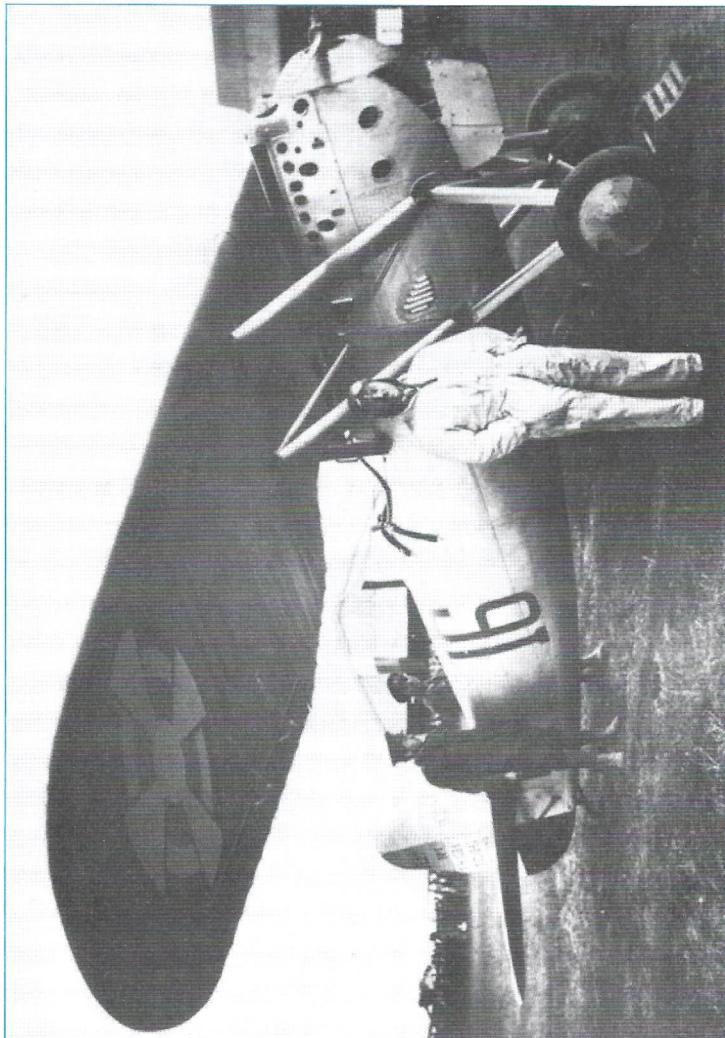
**D 27**  
**1 a**

Tail titles: aircraft type and non-standard s/n.

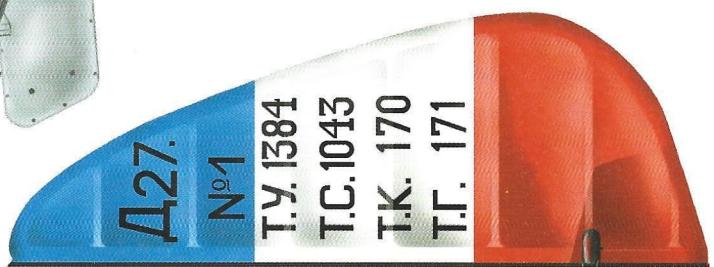
Zmaj-built Dewoitine D.27 C1 №1 "Black 16", W competition team, September 1929.



Artwork by №967/19  
Ognjan M. PETROVIĆ



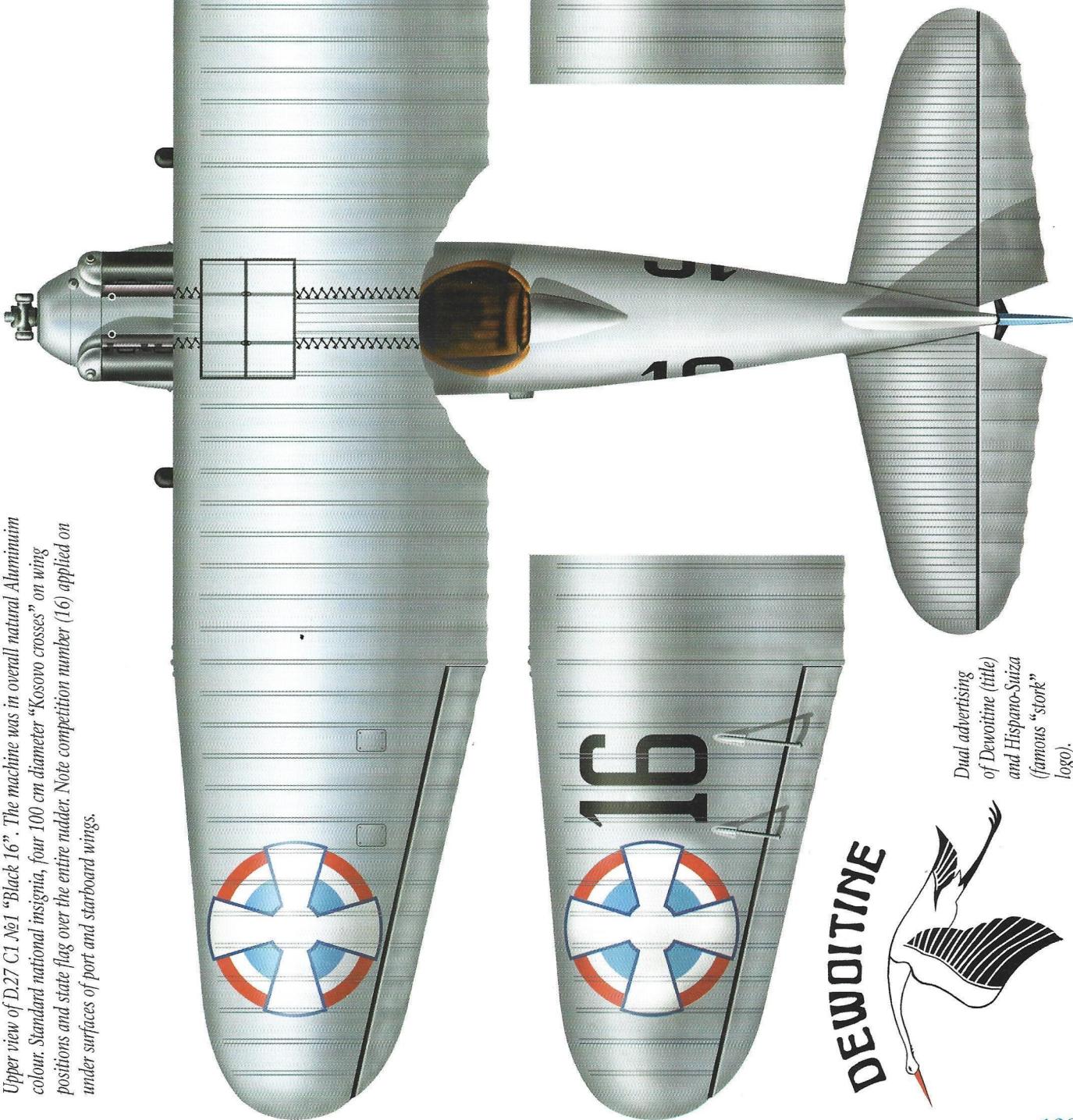
Kap Dragutin Rupčić piloted the Zmaj-built machine №1 "Black 16" at the September 1929 Third Petite Entente and Poland air race in Romania. The pilot in the front of machine is French factory test pilot Marcel Doret. (Dénés Bernád via Aleksandar Ognjević)



Standard W rudder inscriptions.



Logo of Société Aéronautique Francaise-Avions  
Dewoitine.



Upper view of D.27 C1 №1 "Black 16". The machine was in overall natural Aluminum colour. Standard national insignia, four 100 cm diameter "Kosovo crosses" on wing positions and state flag over the entire rudder. Note competition number (16) applied on under surfaces of port and starboard wings.

Artwork by  
№ 968/19  
Ognjan M. PETROVIĆ

САТРАБДЕН У ФАБРИЦИ АВИОНА  
ЗМАЈ-ЗЕМУЊ

Early style logo of  
Zmaj A. D. (Serbian  
Cyrillic: Assembled  
at Aircraft Factory  
Zmaj - Zemun)

Dual advertising  
of Dewoitine (title)  
and Hispano-Suiza  
(famous "stork"  
logo).



# Avia BH-33E (VV Avia-Jupiter)

## Background

At the time of its appearance the Avia BH-33 was one of the best, if not the best, biplane fighter in the world and was considered one of the most appealing aircraft of its time. Its carefully enclosed Jupiter radial engine was also a novelty in the second half of the 1920s. This aircraft had a long service of almost 12 years within VV, from August 1929 to April 1941.

The designers from the Czechoslovak aircraft factory Avia ("Avia" akcionska společnost pro prumysl letecký) from Čakovice, the creators of a large family of famous aircraft with the acronym BH, engineers Pavel Beneš and Miroslav Hajn, developed the prototype BH-21J which flew for the first time on 10 May 1926. They adapted the BH-21 fighter (military designation B-21) to a new 420 mhp Gnôme-Rhône



*Two shots of the second prototype BH.33.s.2, Novi Sad, November 1928: (top) the aircraft during testing by V KSHS, which was conducted in parallel with the French Dewoitine D.27 C1 fighter*

*(Janko Dobnikar family via Predrag Miladinović); (bottom) ground personnel of 251.E 121.VG 1.VP posing for a souvenir snap (Šime Oštrić via Ognjan Petrović).*

*Fuselage sides are vertical, that is the aircraft does not have an oval shape like the production machines.*



Jupiter IV engine. Because the new prototype did not show improvements in speed, a completely new prototype, named BH-33, was designed. The first prototype with a 450 mhp Walter Jupiter VII engine made its first flight on 27 September 1928, which was followed two days later by the aircraft equipped with a Jupiter VI engine. The official trials with the type VI engine were conducted in October in front of the Czechoslovak MNO (*Ministerstvo národní obrany* – People Defence Ministry) Commission. The Avia factory advertised its new aircraft as one of the best European fighters, which was not far from the truth. However, its concept was already becoming obsolete at the end of the 1920s and, in spite of the attempts by the factory to keep pace technologically, the expected success fell short. Only nine BH-33s were manufactured including the prototypes. In 1928, five aircraft designated as B-33 were purchased by the Czechoslovak VL (*Vojensko Letectvo* – Military Aviation) and a year later three were sold to Belgium and one to Poland, with the Polish aircraft equipped with Jupiter VII engines. Poland also manufactured 50 BH-33s under licence, which were locally designated PWS-A or PWS Type A.

*Nº1009, the first of three BH-33Es delivered to W during the summer of 1929.*  
(via Dejan Milojević)

## VV pattern machines

Not long after the first flights took place, the Avia factory sent the second prototype, BH.33.s.2, to the KJ. The showcasing and “practical trials of B.H.33 aircraft” were conducted in October and November 1928 at Novi Sad and Belgrade, with the trial flights flown by Czechoslovak pilots. Numerous comparisons with the new French fighter prototype, the Dewoitine D.27, were conducted and at that time the Yugoslav pilots had the first opportunity to fly the type. The Aviation Herald magazine br. 1-2/1929 for the first time published comparison data between the D.27 and BH-33 using “*practical trials conducted in the country during the month of October and November of last (1928) year*”. With a take-off weight of 1,225 kg, the BH-33 tested as follows: maximum speed of 253 and 246 km/h at 4,000 and 5,000 m, with the climb time to the same altitude of 8 minutes 46 seconds and 12 minutes 41 seconds respectively.

The improved version prototype, the Avia BH-33E with elliptical cross section fuselage made from steel tubing and special covers for each of the Jupiter VI engine cylinders, took off on 28 May 1929. During the summer of the same year, the factory experimented with different engines and a NACA ring. As a result, the factory constructed two additional prototypes, BH-33E-VII with 480 mhp Jupiter VII at 4,000 m and the BH-33H, series B-33 (military designation B-131) with 525 mhp BMW Hornet engine, built under licence from Pratt & Whitney. The Czechoslovak MNO acquired the two prototypes and these took part in the Third *Petite Entente* (Alliance of Czechoslovakia, Yugoslavia and Romania) and Poland air race held between 4 and 8 of September 1929. The KJ purchased three BH-33Es for the same purpose. Following the export to Yugoslavia, one BH-33P was handed over to Poland and three BH-33Es to the Soviet Union. It turned out that BH-33E would not enter series production because at that moment there were no orders. The designers adapted the basic design to a 500 mhp Škoda L engine and the prototype, BH-33L, took off on 2 August. This version was adopted for service by the Czechoslovak Military Aviation, which purchased 81 aircraft, designated Ba-33.

A year or two after the introduction of the Dewoitine D.1 C1 fighter in V KSJS, it was clear that the type was not the best choice. Due to serious construction deficiencies, many accidents took place and

*One of the first three BH-33E-SHS machines in the Air Force inventory, with the original camouflage without the rudder flag. (via Dejan Milojević)*



*Accident involving kap IIk Leonid Bajdak with BH-33E-SHS №1010 "White 1", Zemun airfield, 1931. (Šime Oštric)*



*BH-33E-SHS №1010 in Belgrade during 1929, immediately after its arrival in the country. This aircraft was the second of the first three pattern machines received between July and August of the same year. (Aviation Museum - Belgrade)*



as a result the number of aircraft available declined, while those remaining underwent a modification of the tail assembly. Under these circumstances, in 1929 VV acquired two modern fighter types, three Avia BH-33Es and four Dewoitine D.27 C1s, which were purchased as samples for comparison testing and evaluation in the country before the final choice was made. The D.27 was not accepted, in spite of purchasing a manufacturing license for it.

The first three Yugoslav examples of the Avia fighter (Czechoslovak designation Avia BH-33E-SHS, in accordance with the name of the buyer), were marked with export factory numbers BH.33E.1009, 1010 and 1011 and arrived in the summer of 1929. Aircraft Br.1011 (№1011) first flew on 16 August 1929 in the Czechoslovak Republic and on 25 August Yugoslav pilot *por* Leonid Bajdak conducted a ferry flight to Belgrade. Three BH-33E machines were immediately used (along with three D.27 fighters) in the *Petite Entente* air race in early September. They were piloted by *por* Leonid Bajdak, *kap* Zlatko Šintić and

*kap* Janko Markićević with competition numbers “White 2”, “White 7” and “White 11” respectively. Two of them finished the contest successfully, taking 3<sup>rd</sup> (*por* Bajdak) and 4<sup>th</sup> places (*kap* Šintić). Due to the loss of BH.33E.1011, which was destroyed in a crash by pilot Markićević during practice flights ahead of the air race, the factory delivered a fourth aircraft, BH.33E.1019, as a replacement. Of the first four aircraft, it is known that Br.1010 served with the 252.E during the autumn of 1931.

## Imported machines

At the beginning of the 1930s, VV was in an unfavourable position, apart from 30 or so D.1 aircraft it was also equipped with six Dewoitine D.9 C1, four D.27 C1 and three BH-33E fighters.

Due to the lack of fighters, the capital city’s 6.LP was forced to use two seat Potez-Hispano (Potez 25A2) biplanes in this role. In May 1931, VV had at most 50 single engine fighters on strength and a maximum of 15 two-seat ones.

In such an alarming situation, the Command and the new VV Commander, *gen* Milutin Đ. Nedić, were forced to find a solution. A decision was made to purchase the best fighter types available. The decision to purchase the Avia BH-33E was made with the approval of the state to purchase a large supply of weapons for the Royal Yugoslav Army from the friendly Czechoslovak Republic. While waiting for delivery, the VV planners decided to purchase the newest British fighter, the Hawker Fury, as well. Both types, the older BH-33E and completely new Fury, were the best biplane fighters on the market at the time and their choice was entirely justified. By ordering both types, VV’s intent was to ensure no issues took place with future orders. The licence rights to manufacture BH-33Es were purchased from Avia for 800,000 Czech korunas.

The purchase of three Furies and 20 BH-33Es was realised in 1931. All BH-33Es were flight tested at Čakovice, taken over at Kbely airfield (Prague) by the VV Commission and flown via Vienna to the KJ. The delivery of Avia fighters (№1021–№1040) lasted from May to October of the same year, and the ferry flights were made by Czechoslovak pilots. №1021 was transferred on 21 May to the KJ and №1022 on 25 May. The last aircraft, №1040, took off for the first time in October and was delivered the same month. From 1931 until 1933 these aircraft were regular participants in the King’s Trophy air races which took place on Crown Prince Peter’s birthday each 6 September.

Regarding acquisitions from abroad, VV always whenever possible imported a small quantity followed by purchasing a licence to manufacture in the country. This way it ensured independence of supply and the domestic industry acquired the newest aeronautical technology. This was done with the BH-33E as well, but its production was cancelled at the time in favour of the purchase of additional Furies.

## Ikarus license production

Due to a number of circumstances, a delay of several years followed before British fighters were purchased and VV was forced to make an interim decision to manufacture Avia fighters under licence. This temporary solution served to keep fighter units equipped with a minimal number of required aircraft until more modern aircraft could be sourced. The second important reason for such a decision was to secure work for the Ikarus factory during the economic crisis. If the purchase of Hawker Furies had materialized in the early 1930s, it is almost certain that the license production of the BH-33E would not be realized, because at the time it was unnecessary to purchase additional quantities of already obsolete BH-33E fighters, with engines which lacked a supercharger.

An interesting fact is that VV during the early 1930s did not purchase any of the offered fighter types equipped with 500 to 750 mhp engines, of which most were in the early development phase or their series production was soon expected. Towards the end of December 1933, the VV HQ Technical Commission reviewed the available offers and recommended six different fighter types. Why VV had already decided in the autumn of 1933 to manufacture the BH-33E, which was 70 to 120 km/h slower, instead of considering and evaluating the six recommended fighter types first, is a question which has no logical answer.



Captains (left to right) Siniša Nikolić, Zlatko Šintić and Leonid Bajdak after an aerobatic flight, Aviation Meeting at Zagreb, 24-25 May 1931. (Tihomir Likso)

Nº1040, which entered VV service in October 1931, was the last of 20 imported BH-33E machines. Seen here at Zemun airfield, 12 October 1933. BH-33E remained the basic fighter type in VV service until 1937, when the more advanced Hawker Fury was introduced. Note that "White 3" (which most likely remained from one of the air races) is applied below the wings inboard of the "Kosovo cross". (Šime Oštric)



From November 1932, Ikarus began to repair BH-33Es as well, and from the beginning of August until the end of 1933, it repaired 17 of these aircraft. This shows that the BH-33E was used intensively from the second half of 1931 until the second half of 1933.

In the autumn of 1933, Ikarus began to prepare for manufacturing the BH-33E in accordance with the purchased documentation for BH-33E-VII, and from 11 January until the end of March 1934 the first test flights on the first five aircraft from the first series (Nº1041–Nº1045) were conducted. These were immediately assigned to 6.LP. Six aircraft from the second series (Nº1046–Nº1051) were tested from 18 until 23 July 1935, five aircraft from third series (Nº1052–Nº1056) from 20 May until 13 July 1936 and six aircraft from the fourth series (Nº1057–Nº1062) from 22 February to 13 March 1937. This concluded the production of BH-33Es at Ikarus. All test and transfer flights of Ikarus BH-33Es were conducted by two test pilots, Radoslav Kotarac and Anton Horvat.

The manufacture of the BH-33E at Ikarus was intentionally limited to only five to six aircraft per year for multiple reasons. Apart from the delay in making the decision to select a modern fighter type and the substantially reduced budget, the intent of the Command was to maintain a constant production and to gradually replace the losses and maintain approximately the same number of aircraft in the units. Finally, the number of available Jupiter engines also limited the rate of production. Of the 450 domestically produced Jupiters, 334 were used for Potez 25A2 (Potez Jupiter) and Breguet 19B2 (Breguet Jupiter), and adding to it the number of engines used for overhaul and the necessary reserves, it is clear that VV did not have a sufficient number in stock for other uses.

King's Trophy race, 6 September 1931: three competition machines, BH-33E Nº1038 "White 3" (in the foreground), Dewoitine D.9

"White 1" and BH-33E "White 6" (in the background). Note that "White 6" was one of the first three sample machines without rudder flag. (Šime Oštric via Ognjan Petrović).

## VV peacetime service

With 22 aircraft manufactured at Ikarus, the total number of BH-33E fighters which served in the VV reached 46 aircraft. The type was practically the only fighter aircraft serving with the VV in the period between 1931 to 1937, that is until the British-built Yugoslav Fury (Fury Mk.II) was introduced.

As soon as the 20 BH-33E fighters arrived in the country in 1931, they were assigned to *escadrilles* from 1.VP at Novi Sad and 6.VP at Belgrade, and some were also assigned to pilot schools belonging to the two Regiments. During the 1930s, BH-33E together with other fighter types equipped three fighter air groups. These were 121.VG (251.E and 252.E) belonging to 1.VP, 125.VG (271.E and 272.E) and





127.VG (281.E and 282.E) both belonging to 6.VP. In the spring of 1937, 126.VG was formed within 6.VP and it was equipped with the BH-33E and Fury assigned to 274.E (which until then operated as an independent unit) and 275.E (formed from 284.E). BH-33E fighters flew in some training *escadrilles* in the role of fighter pilot trainers and also in the Air Gunnery School.

Following the reorganization on 1 January 1938, all VV units changed their name and the largest number of fighter *escadrilles* were in the process of rearming with new fighter types. BH-33E fighters remained during 1938-1939 in 51.VG (ex 127.VG), that is within 161.E (formerly 281.E) and 162.E (formerly 282.E), serving in parallel with IK-2s and Hurricanes. The main user of BH-33E fighters was the capital city's 6.VP, which used them for the longest period as well, from 1931 to 1939.

As a standard fighter type, during 1931-1936 the BH-33E participated in all annual air races for the King's Trophy. Only the best pilots from all air regiments and schools took part, usually one machine from each unit. In 1931 four BH-33E fighters participated, together with two Dewoitine D.9s. The four BH-33E pilots were *ppor* Dragomir Nikolić (competition number "White 5"), *nar* Rade Samolov ("White 3", 1<sup>st</sup> place), *ppor* Janko Dobnikar ("White 4", 2<sup>nd</sup> place) and *ppor* Milan Bjelanović ("White 6"). Although three fighter types (D.9, BH-33E and Fury) were scheduled for the 1932 air race, all six competitors flew BH-33Es. They were *ppor* Jovan Miljković, *nar* Karlo Štrbenk, *por* Miodrag Dostanić, *ppor* Miodrag Petrović (2<sup>nd</sup> place), *kap IIk* Milivoje Mišović and *por* Franja Džal (1<sup>st</sup> place), flying "White 1" to "White 6" respectively.

From 1933 the BH-33E was the only type which participated in fighter aircraft air races for the King's Trophy. During the air race on 6 September 1933, six BH-33Es participated with competitor numbers "White 1" through "White 6" applied to №1031, №1028, №1024, №1026, №1029, №1027 respectively. Competitors *nv IIk* Rade Dejanović, *por* Arsenije Boljević (2<sup>nd</sup> place), *maj* Zdenko Gorjup (1<sup>st</sup> place), *por* Dobrosav Tešić, *por* Albin Vessel and *pnar* Vladimir Gorup flew "White 1" to White 6" respectively.

The next year (1934), six BH-33Es participated, three manufactured by Avia (№1039/2, №1025/4, №1023/6) and for the first time three manufactured by Ikarus (№1042/1, №1041/3, №1044/5). Pilots *kap IIk* Stevan Ivanić, *kap IIk* Boško Stanojlović (2<sup>nd</sup> place), *nar* Karlo Rankel, *kap IIk* Ilija Milovanović, *nv IIk* Dušan Milenković and *nv IIk* Vučić Dabetić (1<sup>st</sup> place) flew "White 1" to White 6" respectively.

The last two games, in 1935 and 1936, saw nine BH-33Es participate. The 1936 Yugoslav Aviation Yearbook published (in table form) the list of pilot names and rankings from the 1935 competition starting with first to last place: *kap IIk* Adum Romeo, *por* Ilija Zelenika (2<sup>nd</sup> place), *por* Stanislav Malin (3<sup>rd</sup> place), *por* Vladimir Bajić, *kap IIk* Srbislav Popov, *rez por* Vasilije Stojanović, *kap IIk* Dobrosav Tešić (1<sup>st</sup> place), *por* Ivo Oštrić, *nv* Vučić Dabetić.

The following names were listed in the 1937 Yugoslav Aviation Yearbook competitor's ranking table for the 1936 air race: *kap IIk* Vojislav Topalović (3<sup>rd</sup> place, machine number 1), *kap IIk* Vladimir Jovičić, *kap IIk* Milan Pokorni (2<sup>nd</sup> place), *kap IIk* Dobrosav Tešić, *kap IIk* Adum Romeo (1<sup>st</sup> place), *nar* Djordje Djuričić, *nar* Djordje Vasojević, *nar* Veljko Vujičić (competitor numbers 3 to 9 respectively) and *por* Miloš Gagić (without competitor number in the table).

№1029 with "White 5" was the aircraft of pilot *por* Albin Vesel during the 1933 King's Trophy. (Tomaž Perme)

Nº1023 "White 6" during the 1934 King's Trophy when pilot nv IIIk Vučić Dabetić won 1<sup>st</sup> place in fighter competition. This was the third machine of 20 imported BH-33Es. The aircraft carried standard WV markings of the time period, with Cyrillic inscriptions (type, № and weight values). (Vazduhoplovni glasnik, no 9/1934)



Two shots of Nº1032 prior to take-off, pilot Nedeljko Pajić, 28 September 1934. The competition "White 2" (with dash) below the lower port wing remained from an earlier air race. The fuselage code is partially visible, it was probably "White 10" or "White 12". Note the stencil (BH.33.1032) on the mid wing strut. (both Šime Oštrić via Ognjan Petrović)



In the mid 1930s, pilots from 6.LP formed an aerobatic trio flying the BH-33E and they took part in many air shows across the country. In February 1936, at the Model Show organized by the Royal Flying Club "Naša krila" ("Our Wings") in Belgrade, Ikarus displayed one BH-33E without the fabric skin.

Interesting information is found in the summary from 1 June 1936 which lists single-seat "combat aircraft", which were intended to take part in manoeuvres. Amongst them were 17 BH-33Es. Two BH-33Es were from 1.VP (№1048 from 251.E and №1045 from 252.E), and two from Air Gunnery School (№1034 and №1037). Six belonged to 6.VP, three from *escadrilles* (№1038, №1024 and №1049 from 271., 274. and 281.E respectively) and three from Pilot school (№1041, №1021, №1023). The remaining seven (№1009, №1011, №1052, №1053, №1054, №1055 and №1056) were at Ikarus for repairs, and the summary indicated that they will be repaired.

All Yugoslav BH-33E fighters manufactured by Avia were equipped with Czechoslovak licence-built 450 mhp Walter Jupiter VI engines, and in the later period they received domestically produced engine. The aircraft manufactured under licence were equipped exclusively with the IAM Jupiter 9Ad, the Yugoslav license-built version of the Jupiter VI engine. The Jupiter engine service life was 650 to 1,000 h, depending on series, of which there were three: series A (№1–200), B (№201–276, 466, 477) and C (from 276 onwards).

For all fighter competitions between 1931 and 1933, the 420 mhp Jupiter engine was officially listed as power plant for BH-33E and D.9 C1 fighters. The competitions included always only standard aircraft types within the VV ranks, with standard equipment and armament. At the time, these could only be the Avia-built BH-33Es which still had the original engines. In the VV, there was no differentiation between Walter Jupiter VI and IAM Jupiter 9Ad engines, even though they had different nominal power as a result of a slight increase in rpm. The Yugoslav official *Упутство за аероплански мотор Валтер Јупитер VI* (Walter Jupiter VI aero-engine Manual) printed in 1929 says that "*this manual applies to the engines on aircraft received from Czechoslovakia and the engines manufactured at our factory.*"

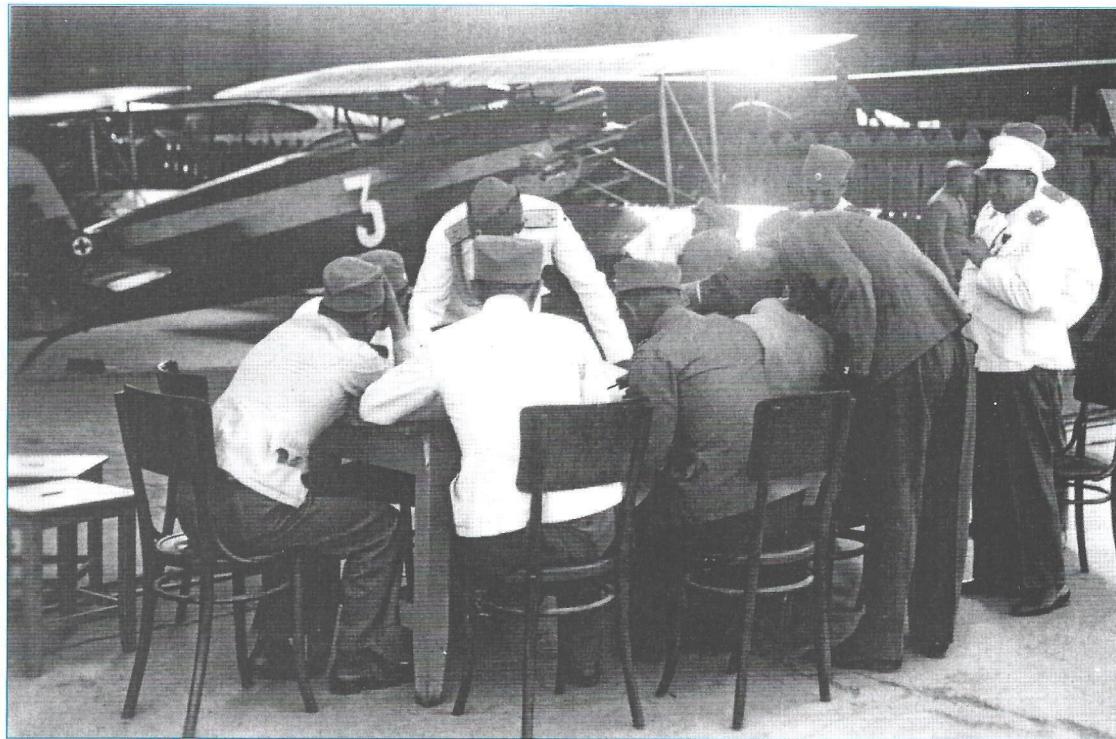
Czechoslovak-built Avia fighters were originally powered with Walter-built Gnôme-Rhône "Jupiter" VI radial engines rated at 543 mhp at 1,850 rpm, and nominal 450 mhp at 1,750 rpm. Ikarus-built and all later overhauled Czechoslovak machines were equipped with IAM-built (*Индустрија аеропланских мотора* – Aero-Engines Industry) Gnôme-Rhône 9Ad Jupiters with maximum 480 mhp and nominal 420 mhp at 1,750 rpm. Propellers were two-blade wooden Avia 507 or Ikarus or Rogožarski licence-built copies.

Standard weapons were two synchronized 7.7 mm M.30 (Darne Modèle 1930) machine guns with 500 rounds each. Gunsight was an Aldis type. Later, the port machine gun was removed when the BH-33E was assigned to a new fighter-trainer role. In 3.PŠ the ammunition for the single machine gun was reduced to 150 rounds, and a pair of aircraft armed in such manner took off in combat against German pilots from the airfield near Podgorica during the 1941 April War. The Avia BH-33E was equipped with a flare pistol with ten signal flares (in the cockpit), racks for six 10-kg bombs (under the fuselage), fire extinguisher (onboard), breathing apparatus (optional) and a first aid set. A Czechoslovak camera gun *Srb à Štys* could be also carried.

*King's Trophy air races: (top left) №1029 "White 5" por Albin Vesel, 1933 (Šime Oštrić); (top middle) №1028 "White 2" por Arsenije Boljević, 1933. (via Miloš Milosavljević); (top right) "White 6" kap Ilk Adum Romeo, 1936. (Vazduhoplovni glasnik no 9/1936); (bottom left) "White 9" nv IIIk Vučić Dabetić, 1935. (Miloš Milosavljević); (bottom right) kap Ilk Dobrosav Tešić, winner of the 1935 King's Trophy race, is sitting in the cockpit of "White 7" (Šime Oštrić via Ognjan Petrović)*



*A group of VV officers holding a discussion in a hangar during the preparations for the 1935 King's Trophy race. In the background "White 3" is visible, the mount of por Stanislav Malin during this air race. (Stanislav Malin via Šime Oštříč)*



Over time, deficiencies with the aircraft became apparent, which resulted in restrictions put in place in 1934. Basic aerobatics such as tailspin, inverted flight and reverse loop were forbidden, which resulted in this aircraft losing its value as a fighter. Apart from this, the aircraft had a tendency to enter a tailspin in an uncontrollable manner and the recovery from it was very difficult. Due to the frequent wing breakages which resulted in several accidents, in May 1936 flying was stopped completely until the necessary construction changes to the wings were completed. Just before the end of its use, due to age and wear, the maximum horizontal speed was limited to 250 km/h. In the middle of April 1940, an order was issued that all remaining Avias be used until their resources were depleted, following which they should be handed over for scrapping, as they were intended to be struck off change next year anyhow.

In accordance with the 1 January 1938 aircraft overview, VV had a total of 27 BH-33Es of which 18 were serviceable and nine were not. The same document defined the remaining service life for this type, which in wartime was until 1937 and in peacetime until 1939. Due to the insufficient number of aircraft in service, this deadline was constantly postponed. By the order of the VV Commander on 13 September 1938, all the BH-33Es with more than 650 hours of flying time were scrapped, while those with over 500 hours were converted to training roles and became fighter trainers. According to the same order, the aircraft were transferred to multi-role use with the end of service date set for the end of 1940, following which they would be used as trainers until the end of 1941.

*Mechanics working on a BH-33E, possibly "White 4", at an unknown airfield. A mechanic in White overalls is directly behind the propeller with the engine running! (Mario Raguž)*





On 1 April 1940, a total of 22 aircraft remained in service, and these were described as “older fighter aircraft”. Three months later, on 30 June, the total was 21 BH-33Es (with seven out of service), but they were not listed as operational military aircraft within the VV. They were declared as trainer machines and assigned to 5.LP and 3.PS, both at Niš as well as other units which trained pilots.

The BH-33E fighters were very manoeuvrable and had a fast rate of climb, but they had a low maximum speed and the armament consisted of only two machine guns which, at the time of their introduction in the VV, was surpassed. Still, the BH-33E became by the end of 1931 the basic fighter type and this lasted until 1937, when the gradual replacement by Hawker Fury fighters began. A number of aircraft remained in service as late as the 1941 April War, the others were being overhauled at the Ikarus factory just before and during the war, which indicates they were intended for further use. The Ikarus factory on 29 August 1938 told rez kap Vasilije J. Stojanović that he was assigned as the factory test pilot and from then on one of his duties was to test fly the repaired and overhauled Avia BH-33Es.

The repair and overhaul of BH-33E fighters was performed at Ikarus. The first three aircraft were handed over to the factory in April and May 1931 and only one (№1009) was repaired in 1932. In 1933 the Ikarus factory repaired 18 aircraft, of which 16 were Avia-built (all except №1021, №1033, №1035, №1036) and one of the first three examples (№1011). During 1934 only four (№1010, №1021, №1026, №1040) were being repaired. In 1935 none were repaired while in 1936 a total of three (№1034, №1037, №1056), in 1937 seven, 1938 one and 1939 an astounding 23. In May 1940 Ikarus handed over two BH-33Es (2022 and 2020) and in October six (2005, 2006 and 2013 are known). Also, when the 1941 April War was broke out, several BH-33Es were undergoing repair.

During the long service in VV, many accidents took place, mostly without casualties but there were some exceptions. Lives lost included those of *ppor* Alojz Knap who crashed in the Sava river by Belgrade on 3 May 1933 while flying №1036, *ppor* Vjekoslav H. Nakić who crashed in the Danube river near Stara Palanka village south of Bela Crkva on 5 October 1933, *nar* Životije R. Srećković who crashed on 16 May 1935 and *nar* Milorad S. Pavkov who crashed on 22 September 1935, both near Zemun.

#### BH-33E deliveries to VV

Month/Year	Quantity	c/n (VV s/n)	Note
07-08/1929	3	1009, 1010, 1011	pattern machines
1930	1	1019	replacement
05/1931	2	1021-1022	
08/1931	8	1023-1030	
09/1931	6	1031-1032, 1034-1037	imported party
10/1931	4	1033, 1038-1040	
01-04/1934	5	1041-1045	Ikarus I series
06-08/1935	6	1046-1051	Ikarus II series
05-07/1936	5	1052-1056	Ikarus III series
02-03/1937	6	1057-1062	Ikarus IV series

№1053 belonged to the 3<sup>rd</sup> batch of Ikarus-built machines. It is shown here during the 1936 King's Trophy with pilot kap Ilk Romeo. This photo was taken during preparations for take-off from Belgrade airfield. Note the Ikarus factory logo on the rudder and different style of competition code, “White 6” with two dashes. (Mario Raguz)

## VV units equipped with Avia BH-33E

Unit	Period	Base	Note
1.VP	1931-1938	Novi Sad	121.VG, also Dewoitine fighters
6.VP	1931-1938	Belgrade	125.VG, also Dewoitine, Potez 25, Fury Mk.I
			126.VG formed 1937, also Fury Mk.II
			127.VG, also Dewoitine, Potez 25
6.LP	1938-1939	Belgrade	51.VG (ex-127.VG), also IK-2 and Hurricane
4.VP	1938	Zagreb	33.VG
5.LP	1940-1941	Niš	Also other types
FPS 6.VP	1931-1938	Belgrade	Also other types; reformed in 3.PS on 1 January 1938
3.PS	1938-1941	Niš	Also other types

## Export to Greece

The Balkan Entente, the alliance agreement between the Kingdom of Yugoslavia, Greece, Romania and Turkey, was signed on 9 February 1934 in Athens. At the beginning of 1935 a rebellion started in Greece, due to the reluctance of the opposition to ratify the alliance agreement. At the request of the Greek Prime Minister Caldaris, the Kingdom of Yugoslavia sent in March 1935 military aid, which amongst other items, consisted of ten or so wagons of bombs, ammunition and 17 aircraft, including 12 Breguet 19B2 light bombers and five BH-33E fighters. The entire aircraft group was under the command of *kap IIk* Siniša V. Nikolić.

The Yugoslav pilots flew the five BH-33Es without any markings directly from Belgrade in March 1935. They flew along the route Belgrade-Kraljevo-Skopje-Thessaloniki-Sedes. The aircraft were taken from 6.VP 126.VG 281.E. According to the information from pilot *nar* Isa B. Mandarić's logbook, on 7 March he conducted a ferry flight in №1039 lasting 3 hours flying at 1,500 meters and this flight was ratified by a seal issued by the 6.VP Aeroplane Workshop.

Both types of aircraft were used against the opposition forces, and after the successfully halted rebellion, the Breguets were returned to Yugoslavia while the BH-33E fighters were purchased by Greece. The Greeks simply called these aircraft *ABIA* (AVIA) and they were marked with Δ1-Δ5 codes. A little later, №1031 was returned and only four aircraft remained in *EBA* (Ελληνική Βασιλική Αεροπορία – Elliniki Vassiliki Aeroporia – EVA or Royal Hellenic Air Force) service. These aircraft served in *Moira 20* (Mira 20) together with two Avia B.534 fighters purchased in 1936. These two types were the only fighter aircraft in Greece until the arrival of Polish PZL P-24F fighters in May 1937. In the latter period BH-33Es served in unarmed liaison roles and were re-designated Δ91, Δ92, Δ94 and Δ95. In 1939 all four were assigned



Four shots of rez por Vasilije Stojanović and his machine №1051 "White 6" during the 1935 King's Trophy race:

(top left) kap IIk Radoljub Bisić posing in front of machine with Stojanović in the cockpit; (bottom left) race control officers' consultation; (top and bottom right) pilot Stojanović (all Šime Oštric via Ognjan Petrović).

to a training unit *Iov συγήνος εκπαίδεύσεως* (Ion training course). They were officially struck off charge on 19 February 1940. Apart from №1031 and №1039, the remaining three VV numbers remain unknown.

## 1941 April War

During the April War, VV operationally used only six BH-33E aircraft, three armed (one in 5.LP and two in 3.PŠ at Mostar) and three unarmed (in 3.PŠ as well). The two armed machines were shot down on 6 April above Podgorica in an unequal combat with far superior Messerschmitt Bf 109E-7s from 7./JG 26 *Schlageter*, where in an act of pure heroism two VV 3.PŠ pilot instructors, *nar* Djordje B. Cvetković (on his 29 birthday) and *ppor* Milenko M. Milivojević, perished. Those two aircraft were the only BH-33Es that actively took part in air combat in World War II, which is especially significant considering the age of these aircraft.

On 28 March 1941, six BH-33Es were at Ikarus (Br.2004, 2012, 2013, 2016, 2021 and 2022) and the Germans captured only two of them (2013 and 2022), plus four aircraft which arrived at the factory after 29 March (2014, 2017, 2018 and 2021). The VOG Commission received on 4 April four repaired aircraft (2004, 2012, 2016 and 2021) and assigned them to 5.VB at Niš, but they also fell into German hands. However, a German document dated 20 May 1941 contains a list of 11 captured *Avia Jäger*, which were labelled as BH-33E, with six aircraft captured at Ikarus, four at Zemun, and one at Sarajevo/Butmir. As a result, the four previously mentioned aircraft were most likely captured at Zemun where VOG left them. The 11<sup>th</sup> machine captured at Sarajevo was 2025 "White 88" from 35.VG 5.LP. That aircraft was flown over from Kumanovo to Uroševac on 7 April 1941 by *pnar* Vojislav Milutinović. Later, this pilot intercepted one Yugoslav Dornier Do-17K landing at Uroševac and, following positive identification, he abandoned the attack. 2025 (ex 36.VG machine) later joined 35.VG and flew over with them to Sarajevo, where it was abandoned and captured by the Germans from *Luftzeugstab 11*. Later, it was sold to the Croats.

Another BH-33E from 5.VB was captured at Niš and transferred to Kraljevo *Luftzeugstab 10*. There it was flown by Georgije (Djordje) Jankovski, a Belarus immigrant and pre-war VV officer, who was at the time a civilian serving with the Germans. He later crashed this machine in an accident in September 1941, which was suspected to be caused by sabotage. This machine was not included in the German list from 22 May, hence it can be considered as the 12<sup>th</sup> BH-33 captured by them. It was prepared for delivery to NDH and had ZNDH (*Zrakoplovstvo Nezavisne Države Hrvatske* – Independent State of Croatia Air Force) markings but did not enter their register.

By the end of June 1941 the Germans separated some 25 aircraft from the war booty (among them four BH-33E) at Zemun airfield for their war ally, the NDH. However, all these aircraft were scrapped at Zemun. The ZNDH used seven BH-33Es from Ikarus (ex VV Br. 2013, 2014, 2017, 2018, 2020, 2022 and 2025), designated now as s/no 3301-3307. The last recorded use was in 1944 with 5. *Zrakoplovnojato* in Sarajevo.

The Italians captured only one BH-33E at Nikšić (Br. 2005/28) which belonged to 3.PŠ. Due to its obsolescence, it was never used and was therefore scrapped.

№1048 "White 1". Two pilots in summer uniform, kap *Ik* Milan Popović is standing on the left. (Ognjan Petrović)





№1027, 6.VP, Zemun airfield in the first half of the thirties. (Aviation Museum – Belgrade)

A group of WV personnel posing in front of a BH-33E undergoing service with the engine cowling removed. Note that the "White 12" fuselage number is painted inside a Black square, which was featured on training machines. (Djordje Nikolić)



WV personnel with a BH-33E in the background, Zemun, 1937. (Djordje Nikolić)



# Camouflage and markings

## Type designations

The factory designation BH-33E-SHS was assigned in 1929 to the Yugoslav version and was painted at Avia factory on the tails of all aircraft as B.H.33E. According to the same principle, the factory designation for the 20 imported series aircraft was BH-33Y (Y for Yugoslavia). VV however did not adopt this factory designation, and on the 20 aircraft a standardized Cyrillic inscription, *AVIA БХ33* (AVIA BH33), was applied instead. The same was applied on the aircraft manufactured under license by Ikarus. The aircraft repaired at Ikarus used an internal factory designation A (for Avia), for example №1059 listed as A-1059. General name in VV slang was simply *Aeuja-Jynumep* (Avia-Jupiter).

## Serial numbers

The aircraft inherited construction (at the same time serial) numbers directly from the factory, that is VV did not apply the usual numeration starting at №1, but instead used Czechoslovak export 10xx numeration with the addition of № prefix. As a result, fuselages had the following numbers applied: on the first four BH-33E.1009, 1010, 1011 and 1019 (note letter "E"), on the first 20 imported aircraft BH.33.1021 to BH.33.1040 and on the aircraft manufactured by Ikarus BH.33.1041 to BH.33.1062. The first four aircraft had tail s/ns in the form of *Bp.10xx* while the remainder had №10xx.

In 1940, the surviving aircraft from Czechoslovakia, and those locally produced, received new EvBr starting with BR.2001 (BR – *broj* or a number).

## Camouflage schemes

The imported aircraft were painted at the factory with a standard Czechoslovak scheme, upper surfaces *Khaki svetlá* (Light Khaki of a more Green than Brown shade, so-called Olive Green in VV jargon) and on lower surfaces *Šedostríbrna* (semi-bright Silver Grey paint, so-called Aluminium Bronze). The top colour wrapped around to the lower surfaces on the wing and horizontal stabilizer leading edge, as well as on the lower section of the fuselage.

The aircraft manufactured by Ikarus had the same camouflage scheme with a slightly different shade of Dark Green (also so-called Olive Green in VV jargon) on the top surfaces, while the lower surfaces were painted with VV Light Blue Grey.

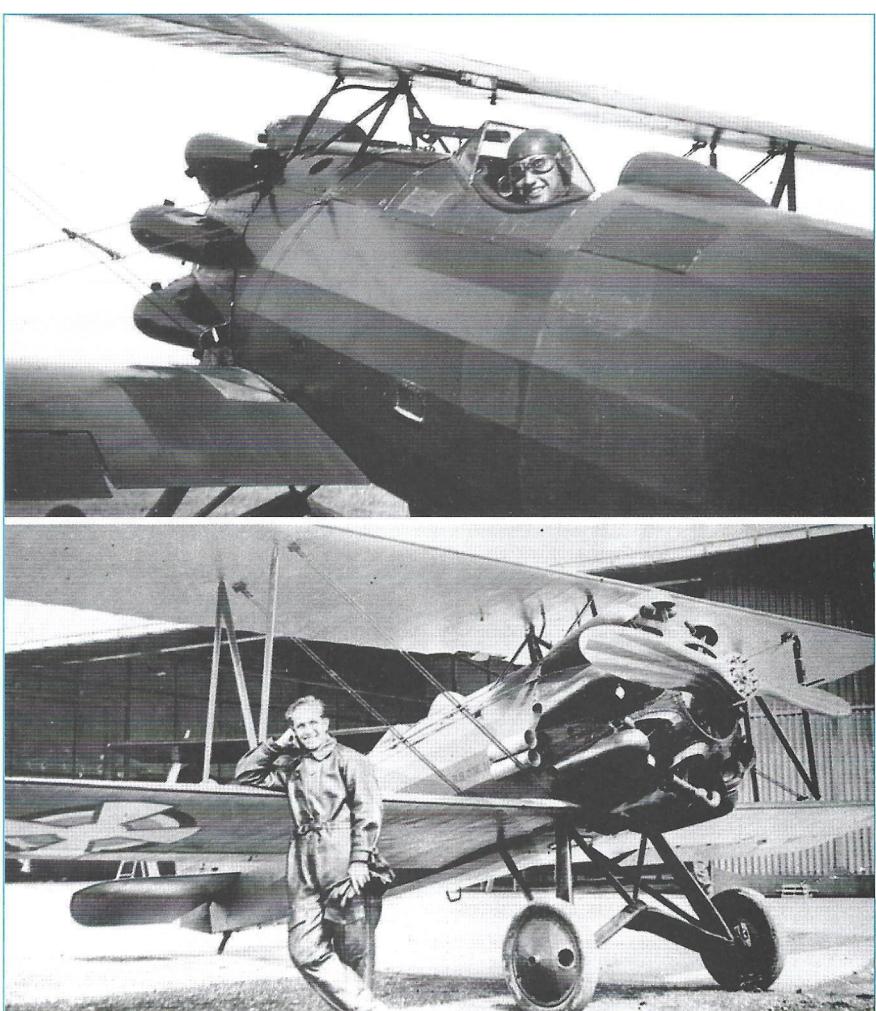
Some of the aircraft which were at Ikarus for overhaul at the end of 1940 and beginning of 1941 received a new fighter aircraft camouflage scheme, with Dark Green and Ochre patches on the top surfaces while the bottom surfaces were painted in VV standard Light Blue Grey.

## Markings and inscriptions

Four Avia-built examples had 120 cm diameter VV insignia, the so called "Kosovo Cross", which was located at four positions, two on top of the upper wings and two below the lower wings. There was no flag on the tail surfaces. On the rudder, a Yellow Latin inscription for aircraft type (B.H.33E) and s/n in Cyrillic (for example *Bp.1010*) were applied, while the aircraft weights were written in Cyrillic Black letters. Some machines had a large code number on the vertical stabilizer. Small factory applied Black aircraft type and number inscriptions (such as B.H.33E.1010 for example), were applied on the forward fuselage, mid strut between the wings, vertical stabilizer and undersides of the upper and lower wings and tailplane.

The series aircraft also carried the same "Kosovo Cross" in four positions. The state flag was as standard painted across the entire

*BH-33E fighters: (top) during take-off, pilot has standard leather helmet and pilot goggles (so-called "brille"). (Aviation Museum – Belgrade); (bottom) nar Matija Mihevc, Zagreb, 1933. (Šime Oštrić via Ognjan Petrović)*





Famous aerobatic VV pilot, kap IIk Kosta Lekić, pictured in front of a BH-33E at Zemun on 1 June 1935. (via Predrag Miladinović)

rudder and a Black inscription in Cyrillic for aircraft type (*АВИА БХ33*) and number (for example №1027) were applied on the Blue field, three rows for mass properties on the White field and one on the Red field. The standard Black writing was on both sides of the front fuselage, such as B.H.33.1027 for example, but some machines during certain periods lacked them. The same writing was applied on the angled part of the N strut on the outside surface.

The machines with the last VV camouflage scheme, with Dark Green and Ochre patches, were intended to use the modified asymmetrically applied “Kosovo cross” on the upper side of the upper port wing and a larger one of the lower side of the lower starboard wing. However, the practice was different, Ikarus overhauled machines had only one 75 cm diameter “Kosovo cross” on the under side of the port lower wing. The small tail stripes in the colours of the state flag were not applied. Evidently, Ikarus used similar types of camouflage and markings on BH-33Es as on the Furies.

During the 1930s, BH-33Es carried White code numbers on the fuselage as well as in between the “Kosovo cross” on the upper and lower wings, and these were applied specially when taking part in air races. Some even carried Black letters below the wings to designate the air-fields, such as S for Skoplje. Sometimes Black markings in a shape of a rhombus or circle were painted on the fuselage with White numbers inside the Black field.

The standard Dark Blue colour which outlined the White cross of the “Kosovo cross” insignia, was in the latter part of the service replaced with a Lighter Blue, which was the same as in the Blue circle of the same marking and on the flag.

#### Aircraft Characteristics Avia BH-33E-SHS (VV BH-33, Avia-Jupiter)

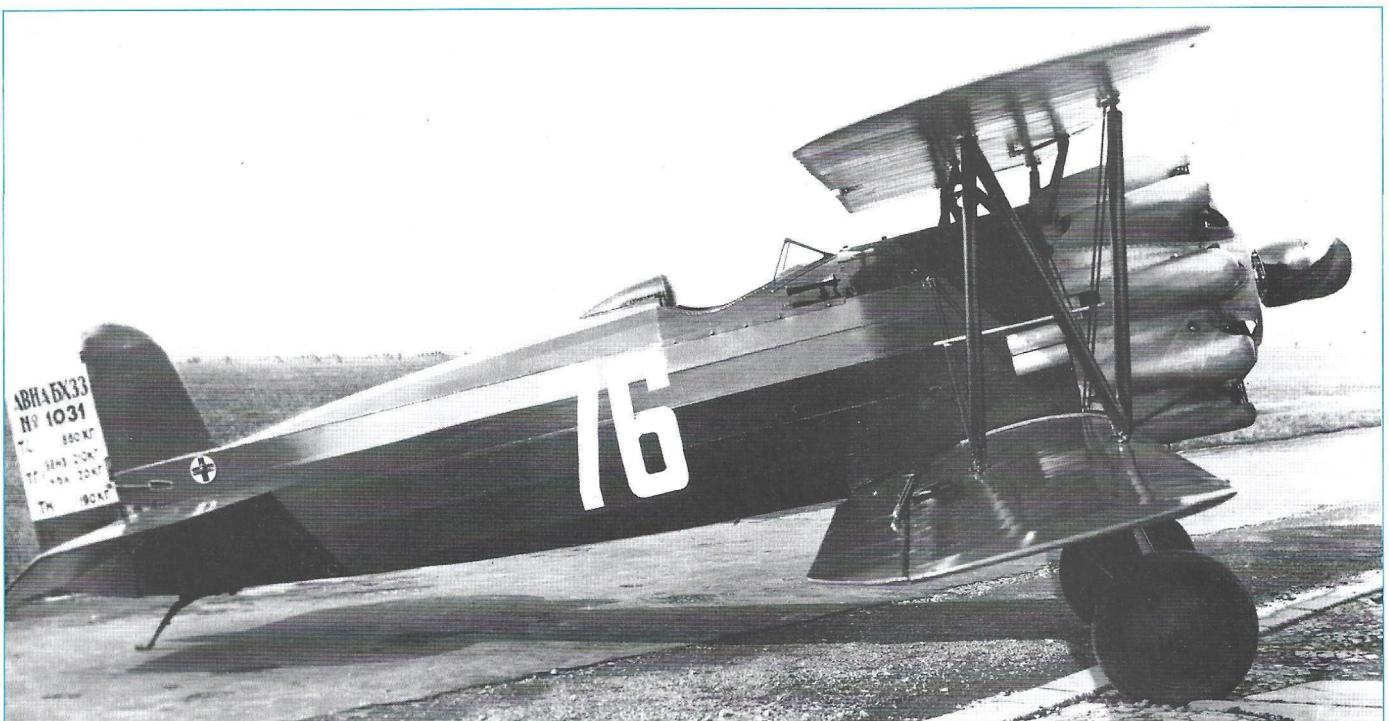
Quantity used:	24
Crew:	1
Years of Service:	1929-1941
Span:	8.9 m (29.2 ft)
Length:	7.0 m (24.2 ft)
Height:	2.8 m (9.2 ft)
Wing area:	22.2 m <sup>2</sup> (239 ft <sup>2</sup> )
Engine:	One 450 mhp Walter-built Gnôme-Rhône Jupiter VI
Empty weight:	860 kg (1,896 lb)
Loaded weight:	1,280 kg (2,822 lb)
Maximum speed:	285 km/h (177 mph) at sea level
Service ceiling:	8,300 m (27,231 ft)
Initial rate of climb:	10.5 m/s
Armament:	Two synchronized 7.7 mm M.30 (Darne) machine guns

#### Aircraft Characteristics Ikarus-built Avia BH-33 (VV BH-33, Avia-Jupiter)

Quantity used:	22
Crew:	1
Years of Service:	1934-1941
Span:	8.9 m (29.2 ft)
Length:	7.0 m (24.2 ft)
Height:	2.8 m (9.2 ft)
Wing area:	22.2 m <sup>2</sup> (239 ft <sup>2</sup> )
Engine:	One 420 mhp IAM-built Gnôme-Rhône 9Ad Jupiter
Empty weight:	860 kg (1,896 lb)
Loaded weight:	1,280 kg (2,822 lb)
Maximum speed:	270 km/h (167.8 mph) at sea level
Service ceiling:	8,000 m (26,248 ft)
Initial rate of climb:	11 m/s
Armament:	Two synchronized 7.7 mm M.30 (Darne) machine guns



Pilot Miodrag Pavlović posing inside his №1046 "White 39", an Ikarus-built machine at Zemun airfield, June 1937. The aircraft manufactured by Ikarus had the same camouflage scheme, with a slightly different shade of Green on the top surfaces, while the lower surfaces were painted with VV Light Blue Grey. Note the Ikarus logo above the aircraft type. (Aviation Museum – Belgrade)



Fine starboard view of №1031 "White 76". Note the very glossy paint. (Robert Čopek)

Two shots of "White 21" which belonged to Zemun-based LPŠ, with code number unusually applied over a Black circle: (left) pilot ppor Stanislav Vouk pictured with a Lufthansa Junkers Ju-52/3m postal aircraft in the background. (Šime Oštrić); (right) pilot pnar Veljko Vujičić ready to take-off. (Ognjan Petrović).





*Artwork by* №969/19  
Ognjan M. PETROVIĆ

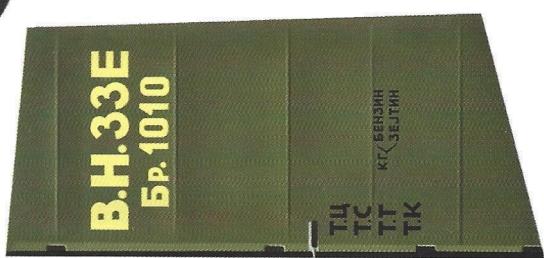
## B.H.33E.1010

Enlarged factory applied construction/  
serial number

Br.1010, one of the first three WV machines, was damaged by kap IIk Leonid Bajdak at Zemun, 1931. Large "White 1" is applied on the vertical stabilizer. Note the absence of gunsight. (Šime Oštric via Ognjan Petrović)

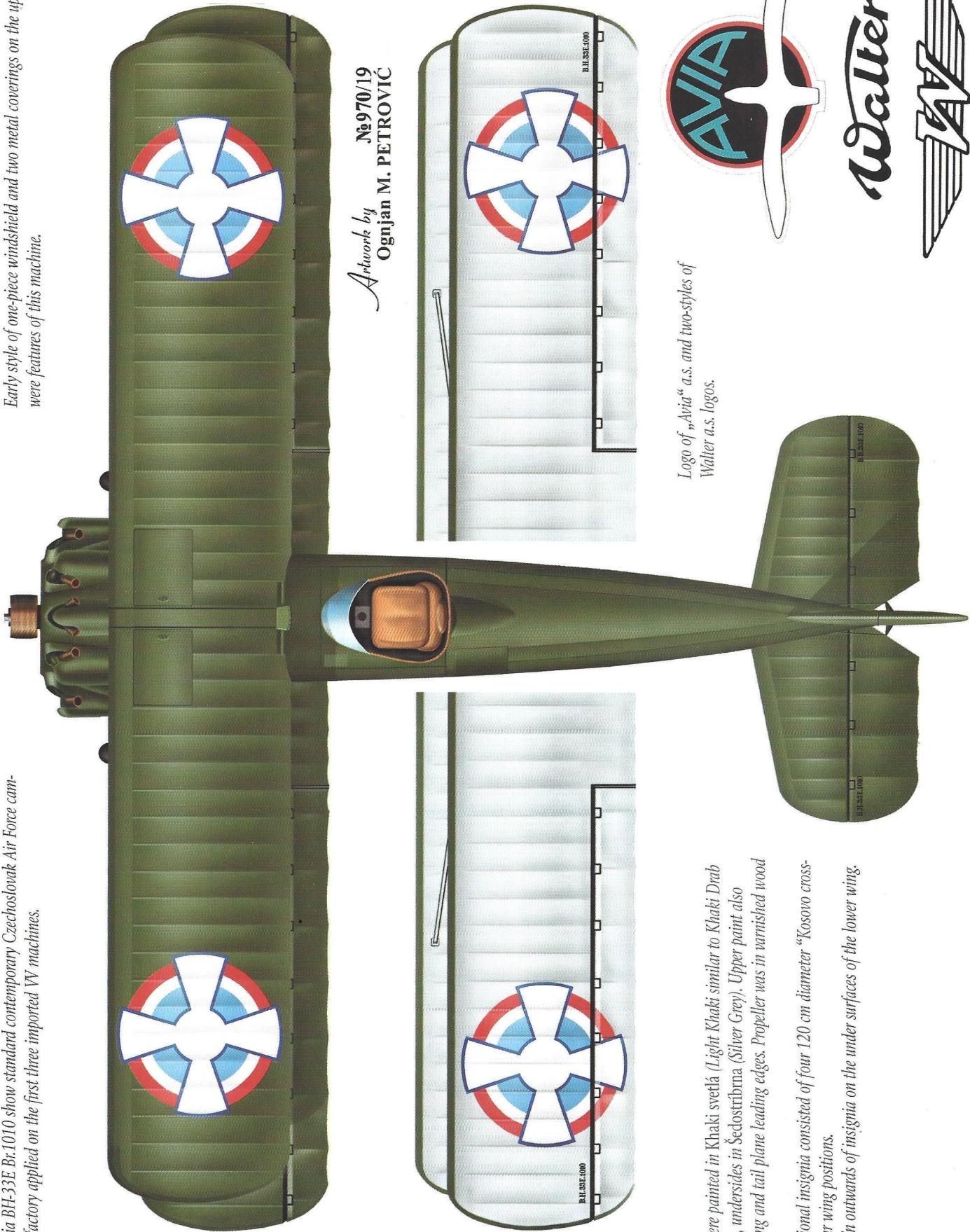


Early style of nudder inscriptions never used on later BH-33E machines: Czechoslovak style aircraft type (B.H.33E) and WV style sh (Br.1010), both in Yellow and aircraft weights in Black Cyrillic letters. Note the absence of zastava (state flag) on the rudder, very rare example of the period, most probably influenced by Czechoslovak practice.



Plan views of Avia BH-33E Br.1010 show standard contemporary Czechoslovak Air Force camouflage scheme, factory applied on the first three imported VV machines.

*Early style of one-piece windshield and two metal coverings on the upper wings were features of this machine.*



Upper surfaces were painted in Khaki světá (Light Khaki similar to Khaki Drab or Yellow-Green), undersides in Šedoštírňa (Silver Grey). Upper paint also applied under wing and tail plane leading edges. Propeller was in varnished wood colour.

Standard WV national insignia consisted of four 120 cm diameter “Kosovo crosses” carried in four wing positions. Note the small *sh* outwards of insignia on the under surfaces of the lower wing.





*Artwork by №971/19  
Ognjan M. PETROVIC*

## B.H.33.1026

*Enlarged factory applied construction/  
serial number*

Competition number "White 4" was applied at  
four wing positions and both fuselage sides. This  
machine had standard Czechoslovak camouflage  
scheme and standard VV insignias.



Pilot por Dobrošan Tešić is strapped in and  
the aircraft is ready for take-off during the  
1933 King's Trophy when this pilot won 3<sup>rd</sup>  
place (Janko Dobnikar Family via Predrag  
Miladinović).

*Standardized VV under inscriptions.*

Ikarus-built Avia BH-33 №1061 "White 86", 1.VP, VV, Novi Sad airfield, 1937.



## B.H.33.1061

Enlarged factory applied construction/  
serial number

Three local young girls pictured beside the №1061 at Novi Sad. Note the legend in the upper right corner, which gives the incorrect date. Judging by the delivery time of №1061, the correct date could be 1937 or later. Note Srđa Šćip's gun-camera. (Veljko Vučković via Predrag Miladinović)

Artwork by  
№972/19  
Ognjan M. PETROVIĆ

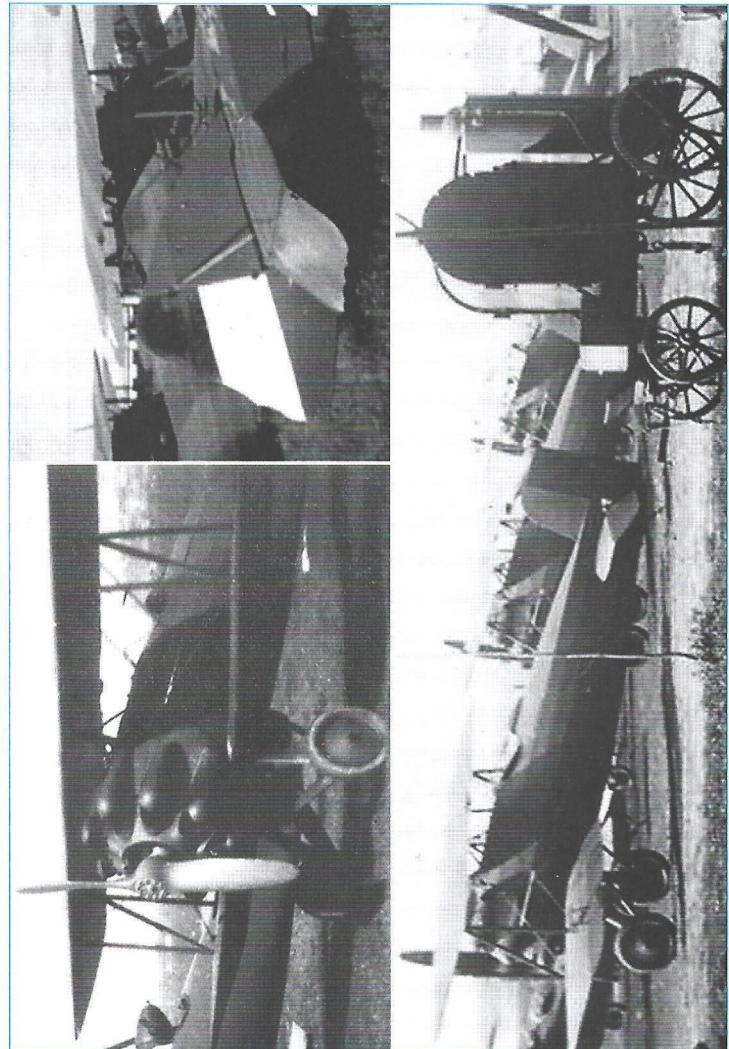


Standardized BH-33's rudder inscriptions plus  
Ikarus logo

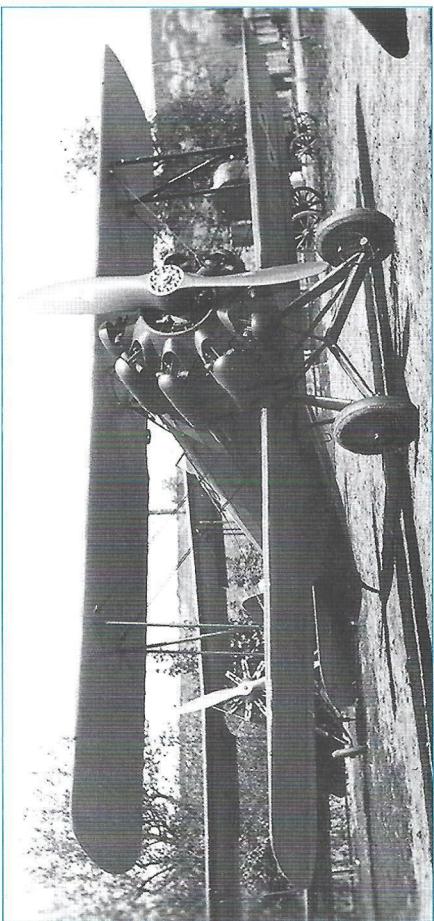
Avia BH-33 unknown s/n, Ikarus factory, Zemun, 1941.



*Artwork by* №973/19  
Ognjan M. PETROVIĆ

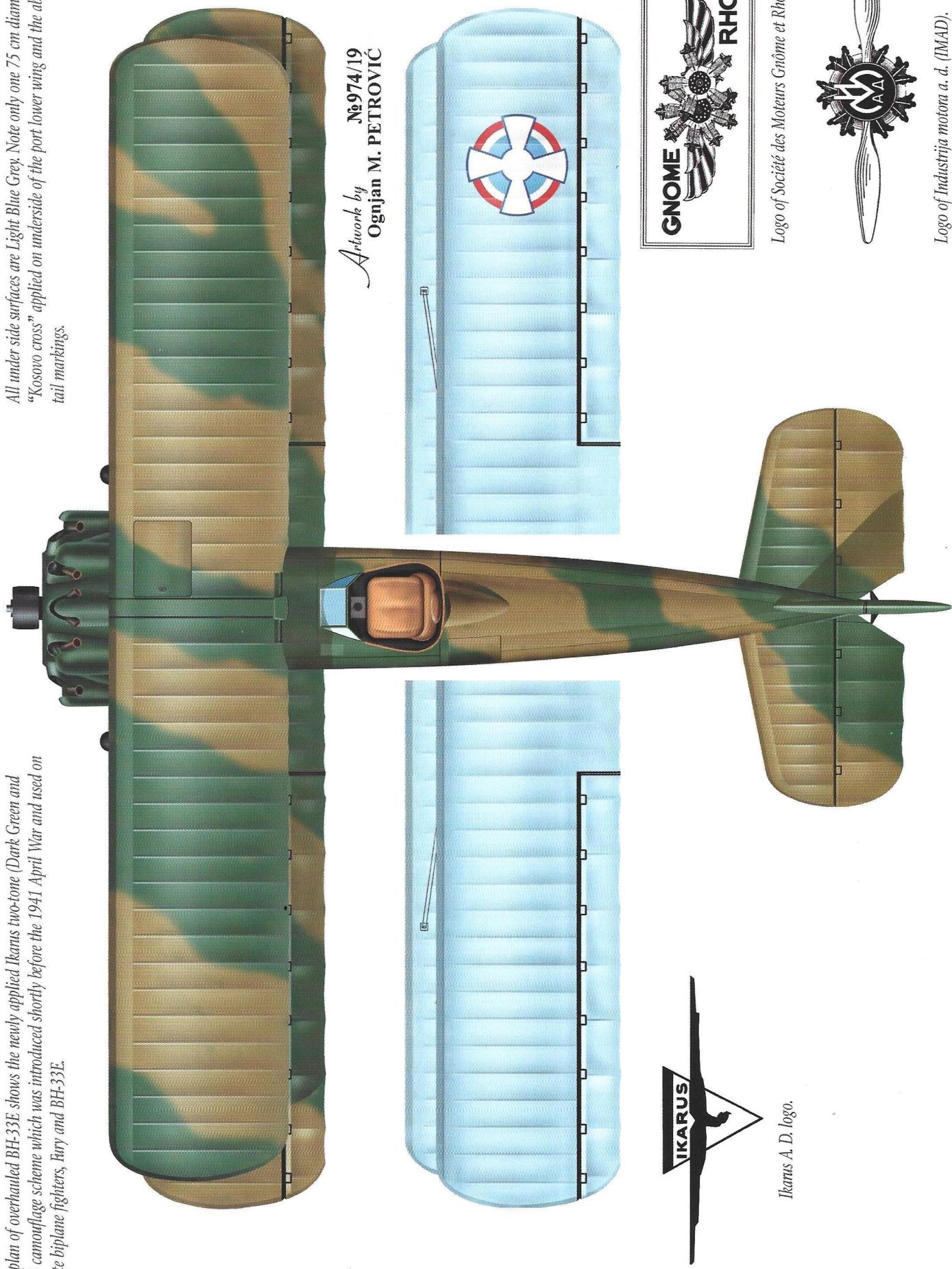


Four shots of captured BH-33Es at Zemun airfield in May-June 1941. In total four Ikarus-overhauled BH-33Es awaiting delivery to 5.VB at Niš were captured at Zemun airfield by Wehrmacht. They were scrapped instead of being passed on to German ally the NDH. Note the Ikarus logo on the propeller blades. (all Jan van den Heuvel via Aleksandar Ognjević)

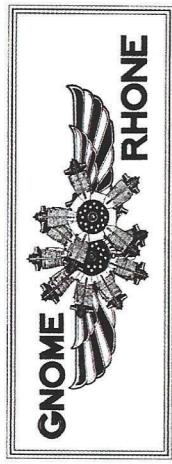


Upper plan of overhauled BH-33E shows the newly applied Ikarus two-tone (Dark Green and Ochre) camouflage scheme which was introduced shortly before the 1941 April War and used on obsolete biplane fighters, Fury and BH-33E.

All under side surfaces are Light Blue Grey. Note only one 75 cm diameter "Kosovo cross" applied on underside of the port lower wing and the absence of tail markings.



Ikarus A.D. logo.



Logo of Société des Moteurs Gnome et Rhône.



Logo of Industrija motora a.d. (IMAD).

# Potez 25 A2 (VV Potez-Hispano 450 KS)

## Background

In 1925 the French Potez factory (*Avions H. Potez*) at Méaulte produced a prototype of a multi-purpose and reconnaissance sesquiplane, the Potez 25, which was also generally known as Potez XXV, P.25 or Po.25. It was a direct development of an earlier model from 1921, the series produced Potez 15, and the experimental Potez 24 from 1924. The designer was engineer Louis Coroller, the head of the Potez design bureau. Production reached 4,000 machines in 87 different versions, equipped with various engines ranging from 450-600 mhp. The Potez 25 represented one of the most successful production programs in French military aviation. The main versions, in accordance with the purpose, were the reconnaissance Potez 25A.2 (A2 class – *armée biplace*) and the day bomber Potez 25B.2 (B2 class – *bombardement biplace*). This aircraft was exported to 22 countries and licence production was organized in Poland, Romania, KJ and Portugal.

Considering that the Potez 25 was designed to be equipped with different engines from the very beginning, between 1925 and 1930 Potez produced 11 versions with 450, 500 or 600 mhp Hispano-Suiza engines. The first two versions appeared in 1925 (Potez 25.5 and 25.9, both for Spain) and in 1927 two more (25.20 for Serbia and 25.29 for Switzerland), both in the A2 variant. It is interesting that in French documents from 1927 Serbia is still mentioned as the purchaser of aircraft (and weapons), despite the fact that as of 1 December 1918 it was part of the newly formed KSHS. Two versions were also produced in 1928 (25.36 A2 for Romania and 25.40 A2/B2 for China) and three in 1929 (25.45 A2 prototype with 600 mhp engine, 25.47 VIP and 25 A2 with unknown factory designation for Uruguay). In 1930 the last two versions were produced (both A2 with unknown factory designations for Greece and Ethiopia).

## Service in the Kingdom

*A head on view of a VV Potez 25A2, one of 15 Hispano-Suiza 12Ha powered machines, which was used temporarily in the fighter role. (Djordje Nikolić)*

At the beginning of 1926, in accordance with the armament and modernization program from the same year, V KSHS included Potez 25s in the domestic manufacturing effort. The Ikarus factory was assigned the licence production of the Potez 25A2 with a Gnôme-Rhône Jupiter engine. Following the purchase of the licence from the French factory, Ikarus was assigned production at its new facility, whose construction was planned at Zemun, for a series of 200 Potez 25s in the reconnaissance version with a Jupiter radial engine. In 1932 the quantity was increased by a further 20 aircraft.





Potez 25A2 №26 "White 11" pictured here during the 1928 Petite Entente race, held between 6 and 13 August 1928 in Czechoslovakia. This aircraft was piloted by kap Ilk Ferdo Gradišnik while the observer was kap Ilk Kamilo Lukanović. The machine did not reach the altitude limit of 5,000 m and was subsequently disqualified. (Technical Museum Brno)



Two shots of Potez-Hispano №26 "White 11" in August 1928: (top) Yugoslav pilots along with their Czechoslovak hosts in front of the aircraft. (Dan Antoniu via Michal Dub); (bottom) "White 11" being prepared for a race. Note that next to "White 11" there is a small "Black 26" which corresponds to №26, which was applied on the rudder. (National Digital Archive - Poland)



*No.36 "White 1" was the second V KSHS Potez-Hispano participating in the 1928 Petite Entente race. It was piloted by kap IIk Hinko Hubl and por Miodrag Ložić. As the aircraft did not land in Iași, Romania, the crew was disqualified (Ivo Pujman collection via Michal Dub)*

Since at least one year was required for factory construction and organisation of production, and there was an ever-increasing danger of a confrontation with Italy, towards the end of 1926 and during 1927 an urgent purchase of a large number of French aircraft, of many types, was undertaken. Included in this purchase was the import of 40 Potez 25 "combat biplanes" in two versions. The first version "средњи бомбаш" (medium bomber), that is the reconnaissance-bombing Potez 25 B2 (factory designation Potez 25.18 A2B2, version 1926), was equipped with a 450 mhp Lorraine-Dietrich 12Eb engine. The second version was the reconnaissance Potez 25A2 (Potez 25.20 A2, version 1927) with a 450 mhp Hispano-Suiza 12Ha engine. According to the V KSHS custom, these types received the informal names Potez-Loren (Potez-Lorraine) and Potez-Hispano.

KSHS in 1927 imported 15 reconnaissance two-seaters, the Potez 25A2, to equip one reconnaissance *escadrille* (plus reserve). During the first two years in service, they were used mainly in their primary reconnaissance role. Two V KSHS aircraft took part, on 8 and 9 August 1928, in the Second *Petite Entente* and Poland race, carrying numbers "White 1" (aircraft No.36, pilot *kap IIk* Hinko Hubl and observer *por* Miodrag Ložić) and "White 11" (aircraft No.26, *kap IIk* Ferdo Gradišnik and observer *kap IIk* Kamilo Lukanić). Unfortunately, neither of the crews qualified. The Politika daily newspaper reported on 11 August 1928 that "White 1" "crashed before Prague, without consequences".

Due to the serious world economic crisis in the late 1920s and the very beginning of the 1930s, problems in service with Dewoitine D.1 and a serious lack of fighters, VV was forced to temporarily use their Potez-Hispano as two-seat fighters (C2 class – *chasse biplace*) in the Belgrade based 6.VP. For this purpose, the type was lightened by removing all reconnaissance equipment. Many VV aircraft flew at a large parade organized in 1931, which included two-seater Potez-Hispanos. The magazine *Војни весник* (Military Herald) No.9 from 1931 mentions the overflight by "one group of Potez fighter two-seaters made up of two *escadrilles*". Judging by this column, all available Potez-Hispano aircraft took part in the parade. With the arrival of Czechoslovak Avia BH-33E fighters in 1931, the need for two-seat fighters diminished during the next year. As a result Potez-Hispano machines returned to their original duties. After a little over two years, the use of the type as a two-seater fighter in VV service stopped altogether.

At least four *escadrilles*, which were considered fighter units, had in their ranks two-seat Potez-Hispanos. At Novi Sad airfield in the spring of 1927 252.E (renamed ex-10 combat *escadrille*) within 121.VG 1.VP was formed and it was armed with Potez-Hispanos. The same type also equipped 271.E within 125.VG, which used in parallel Dewoitine D.1 C1 fighters. That group in March 1927 relocated to Zemun airfield and Belgrade's 6.VP was formed from it. Two more *escadrilles*, 281.E and 282.E (both formed in 1929 within new 127.VG 6.VP), were equipped with the same two seater type.

The Potez-Hispano took part in other events in the country, such as the King's Trophy air race held on 6 September 1931, in the "military two seater" category. A sole Potez-Hispano participated in the race, flown by pilot *ppor* Jefto Guzina and observer *ppor* Janko Novović. The announcement for the 1932 race included one Potez-Hispano, however no crews applied. In the summary from 1 July 1936, all military reconnaissance two-seaters were counted on to participate in the manoeuvre, including Potez-Hispanos No.26 (from 252.E, 1.VP), No.27, No.30 and No.32 (all from 626.VG, 6.VP).



Fine shot of Potez 25A2 №27 at Zagreb airfield during 1930. Note the large "White 8" unit code on the vertical stabilizer. (Robert Čopek)



The same machine in flight escorting VV Commander in chief in 1930. (Aviation Museum - Belgrade)

Yugoslav Potez 25s used the Hispano-Suiza 450 mhp 12Ha engine before the French Air Force machines received the same engine (specifically 12Gb and 12Hb, both 500 mhp). This water-cooled twelve cylinder Hispano-Suiza 12Ha Vee-60 engine (factory designation Type 51) had a rating of 450 mhp at 1,800 rpm and maximum rating of 485 mhp at 2,000 rpm. In the later period of use, some machines were re-engined with IAM-built Gnôme-Rhône Jupiter engines.

The Potez-Hispano was armed with three machine guns, one forward firing in the forward fuselage and two flexible (twinned) mounted on the standardized French T.O.7 turret for covering fire from the rear and above. The pilot used a *collimateur Chrétien* gun sight. Apart from standard equipment, the aircraft was able to carry a camera in the lower part of the fuselage. For winter operations, skis produced at Novi Sad were used.

On 1 January 1938 VV had seven Potez-Hispano aircraft, of which three were operational and four non serviceable. Wartime service was not considered, while peacetime use was planned until the end of 1939. In September 1938 Potez-Hispano machines with over 800 flight hours were struck off charge and major repairs to Hispano 12Ha engines were halted. The remaining machines were transferred to multi-purpose use, and on 1 January 1939 they were transferred to training use with the end of use date set for the end of the year. Despite the removal from active service at the end of 1939, at least one aircraft remained until the 1941 April War. This sole aircraft was №35 from 3.VIG (Ваздухопловна извијачка група – Air Reconnaissance Group) based at Staro Topolje airfield near Djakovo and was captured by the Hungarians after a crash landing. This unit was one of seven specialized aviation groups in service within AV (Армијско ваздухопловство – Army Co-operation Aviation), a newly-formed VV component in 1940.

Potez-Hispano with unknown № after a landing accident. Note the collapsed undercarriage. (Šime Oštrić)



Unknown VV officer photographed in front of a Potez-Hispano. Note the landing light under the starboard lower wing. (Šime Oštrić)



Ground personnel with commanding officers pose in front of VV Potez-Hispano at Novi Sad airfield, early thirties. Note Kraljevo-built Breguet 19B2 №1002 in the background. (Djordje Nikolić)



# Camouflage and Markings

## Type designations

Hispano-powered version was designated by the Potez Bureau as Potez 25.20 (A2), while the factory designation was Potez 25 A2. Official VV designation was also Potez 25A2, while this biplane was widely known in V KSHS, and later in VV jargon, as *Помез-Хиспано* (Potez-Hispano) or *Помез 25-Хиспано* (Potez-25 Hispano).



Potez-Hispano "White 11" (unknown №) prepared for a flight with fueling in progress at Zemun airfield on 6 September 1931. The pilot was ppor Jefto Guzina, observer ppor Janko Novović. According to manner adopted for King's Trophy race, competition number "White 11" is applied below both wings and on the fuselage. Note that this number is different than those during the visit to Czechoslovakia. (Čedomir Janić)

## Serial numbers

Both imported Potez 25 series were marked with a range of serial numbers (№), Potez-Lorraines with №1–№25 and Potez-Hispanos with №26–№40.

## Codes and inscriptions

Standard VV inscriptions were used on the rudder. Aircraft type (POTEZ 25A2) and s/n (№) were applied in two rows over the Blue field on the rudder flag, and aircraft weights in four rows over the White and Red fields. Some machines only listed the total weight (TU 2048 kg).

Enlarged serial number (without №) was repeated on the fuselage sides. White code numbers were applied on the fuselage or vertical stabilizer. Competition numbers were carried on the fuselage and below the lower wings.

## National insignia

Standard "Kosovo cross" insignia were applied in four wing positions and the state flag was applied over the entire rudder.

## Colour schemes

Potez-Hispano aircraft were painted overall Dark Green.

## Aircraft Characteristics Potez 25A2 (VV Potez-Hispano)

Quantity used:	15
Crew:	2
Years of Service:	1927-1941
Span:	14.1 m (46.3 ft)
Length:	9.2 m (30.2 ft)
Height:	3.5 m (11.6 ft)
Wing area:	47 m <sup>2</sup> (506 ft <sup>2</sup> )
Engine:	One 450 mhp Hispano-Suiza 12Ha
Empty weight:	1,414 kg (3,118 lb)
Loaded weight:	2,042 kg (4,503 lb)
Maximum speed:*	230 km/h (143 mph) at sea level
Service ceiling:	7,300 m (23,950 ft)
Initial rate of climb:	4.8 m/s (15.7 ft/s)
Armament: **	One synchronized 7.7 mm M.30 (Darne M.1930) machine guns and two flexible machine guns of the same type

\* The instructions for 1931 King's Trophy race indicated a maximum speed of 215 km/h.

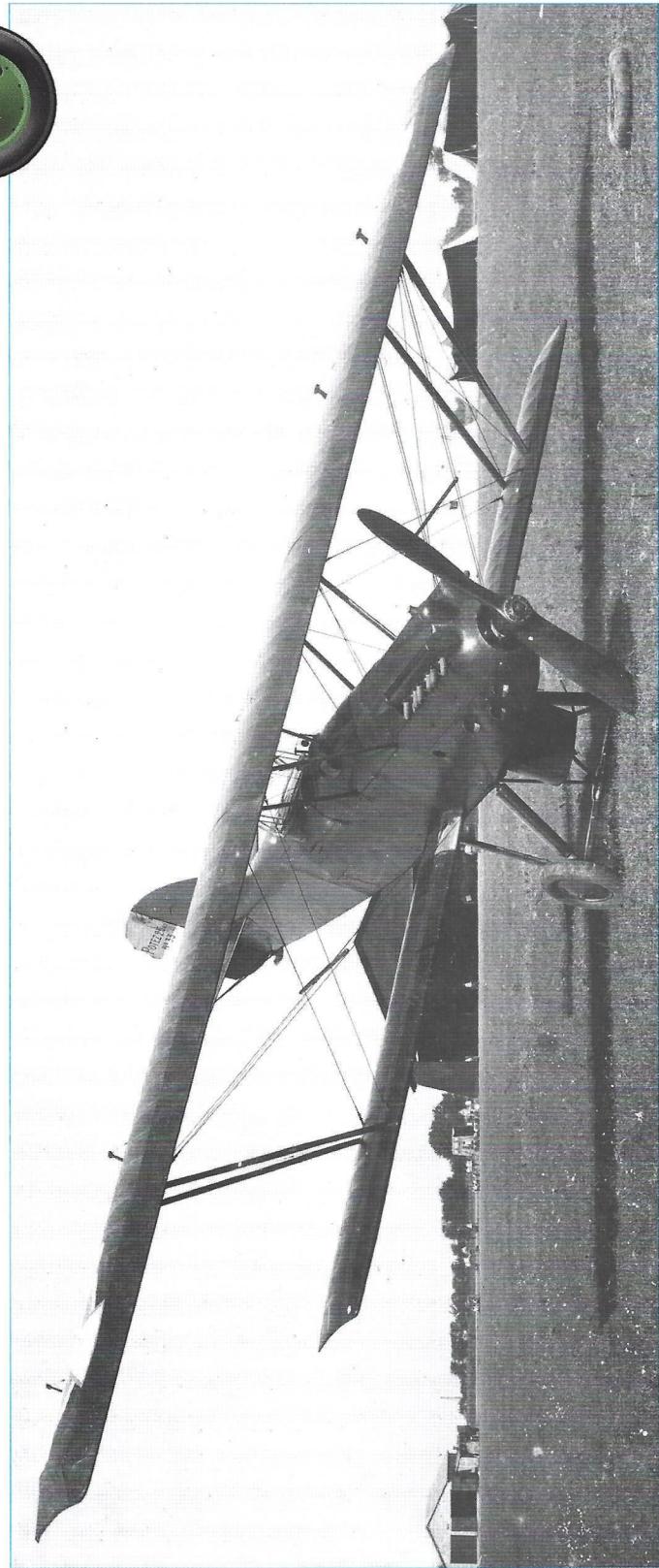
\*\* Darne machine guns, adopted by VV in 1930, replaced the initial fixed 7.7 mm Vickers and flexible 7.7 mm Lewis machine guns

Potez 25A2 (Potez-Hispano) №33 "Black 33", 6.VP, VV, Pančeva airfield, 1931.



*Artwork by*  
№944/19  
Ognjan M. PETROVIĆ

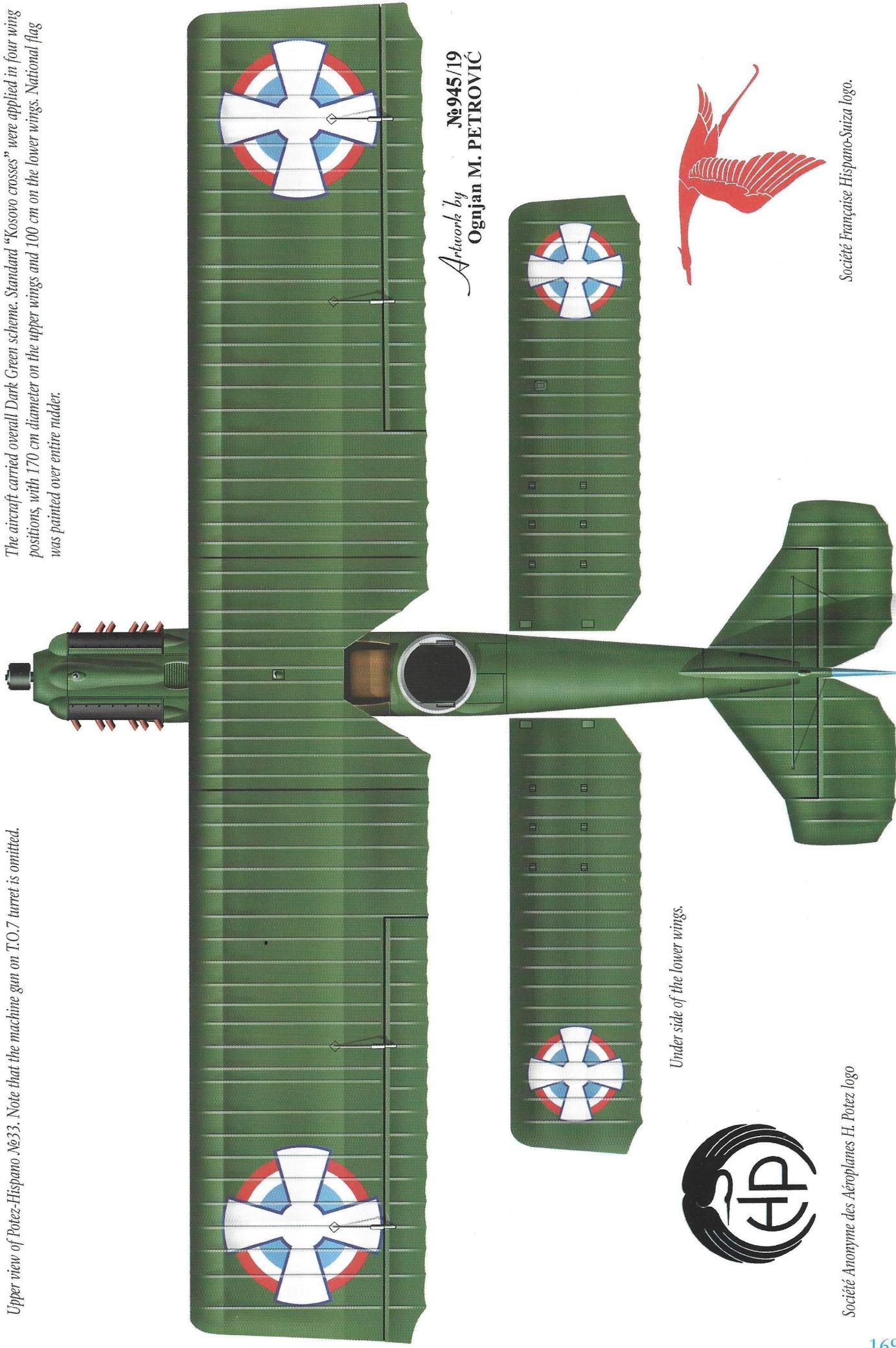
A landing mishap on 14 July 1931 at Pančeva airfield resulted in this Potez 25A2 №33 ending up on its nose. The pilot was nar Trifun R. Amidžić (Amidžić family via Milan Micevski)



Standard tail inscriptions (type, ch and four aircraft weights)

Upper view of Potez-Hispano №33. Note that the machine gun on T.O.7 turret is omitted.

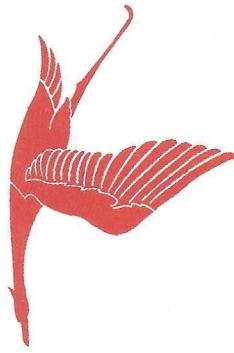
The aircraft carried overall Dark Green scheme. Standard "Kosovo crosses" were applied in four wing positions, with 170 cm diameter on the upper wings and 100 cm on the lower wings. National flag was painted over entire nacelle.



*Under side of the lower wings.*



Société Anonyme des Aéroplanes H. Potez logo



Société Française Hispano-Suiza logo.

Two views of W Potez-Hispano: (top) pilot proudly posing in front of №27; (bottom) aviator and his child pictured in "White 22".  
(both Šime Oštric)



Potez-Hispano №33 "White 3" from 3.VIG photographed by the Hungarians after the crash on 11 April 1941 in Hungary (László Jávor via Čedomir Janić)



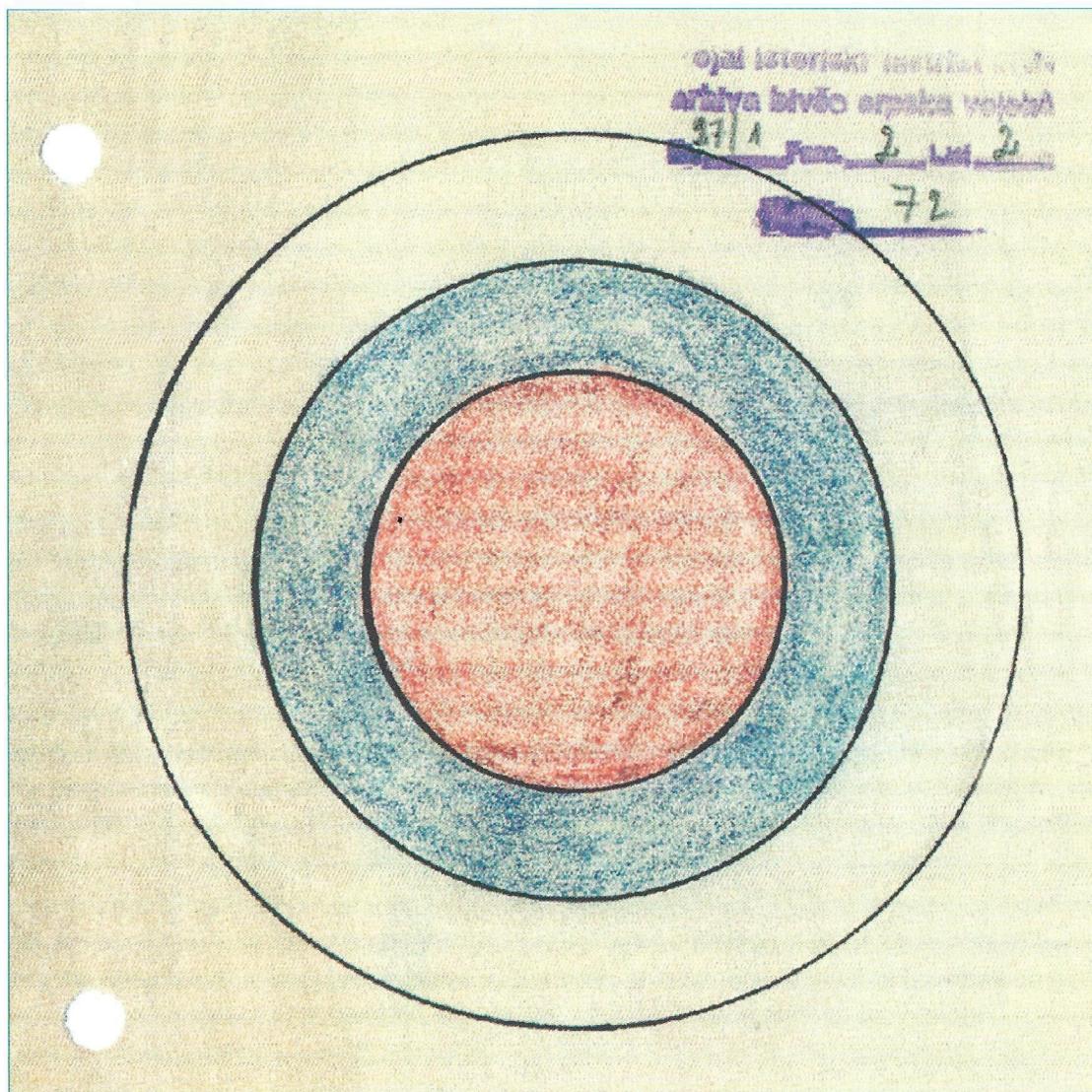
# Appendices

## Appendix 1. Markings and Insignia 1918-1941

### National markings

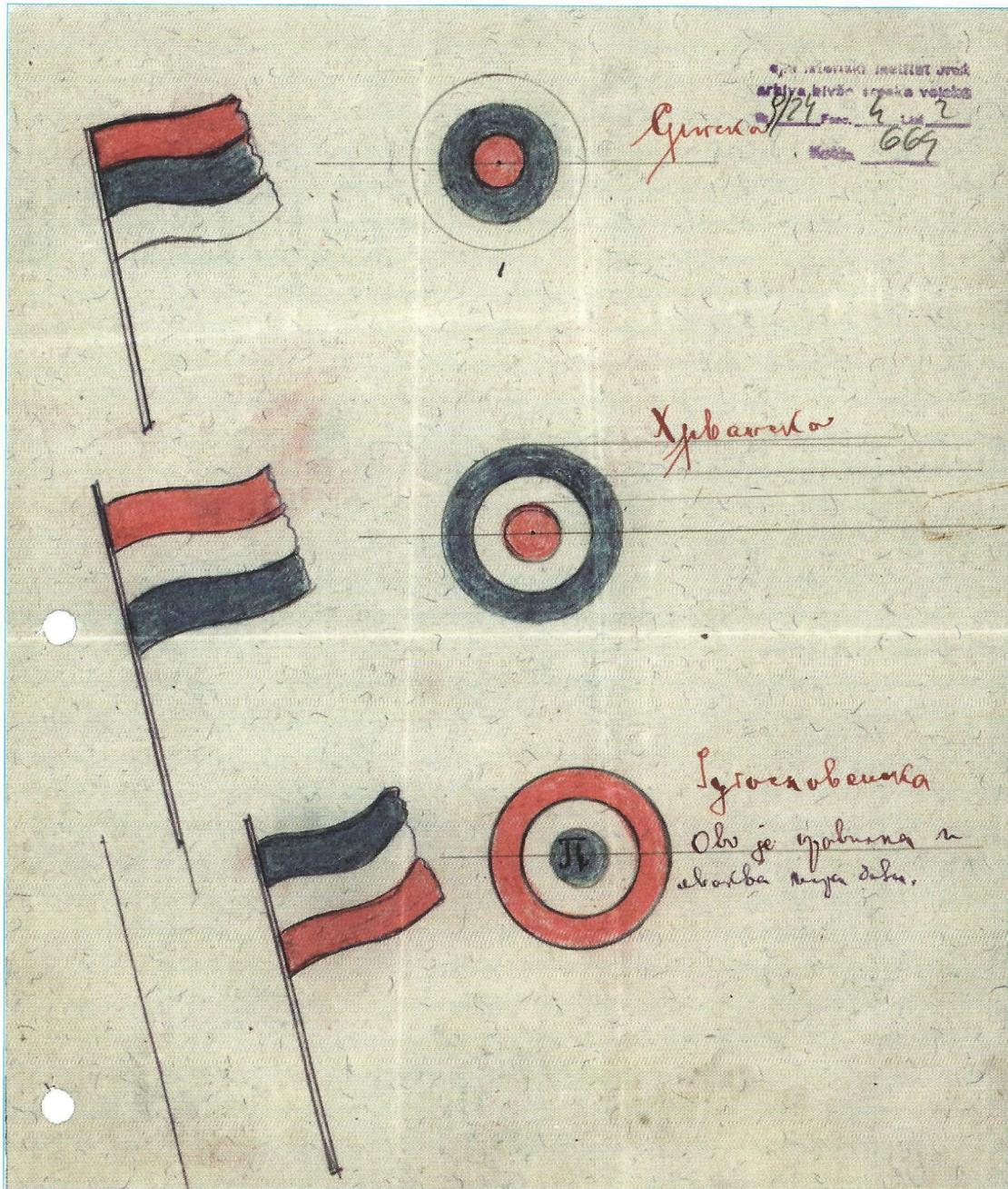
On 19 April 1909, a Serbian national flag borrowed from the consulate in Munich was hung on the first spherical balloon “*Cpōija*” (“Serbia”, August Riedinger Kugelballon № III M.1898 W.Nr. 769) during its acceptance at Gersthofen, Germany. This marked the first time such a contraption flew with Serbian national insignia.

The first markings in the Serbian Air Service were a result of frequent incursions into Serbian air space by Austro-Hungarian aircraft. On 3 March 1913 HM King Peter I signed a declaration about aerial devices, which did not include specifics in writing concerning markings but it did say that each device must be marked with some type of sign. The first four aircraft of the Serbian Aviation Command at



Original appearance of Serbian Air Force cockade according to the order from the summer of 1918. (Military Archive – Belgrade)

Official review from 1919  
with national flags and  
cockades. (Military Archive –  
Belgrade)



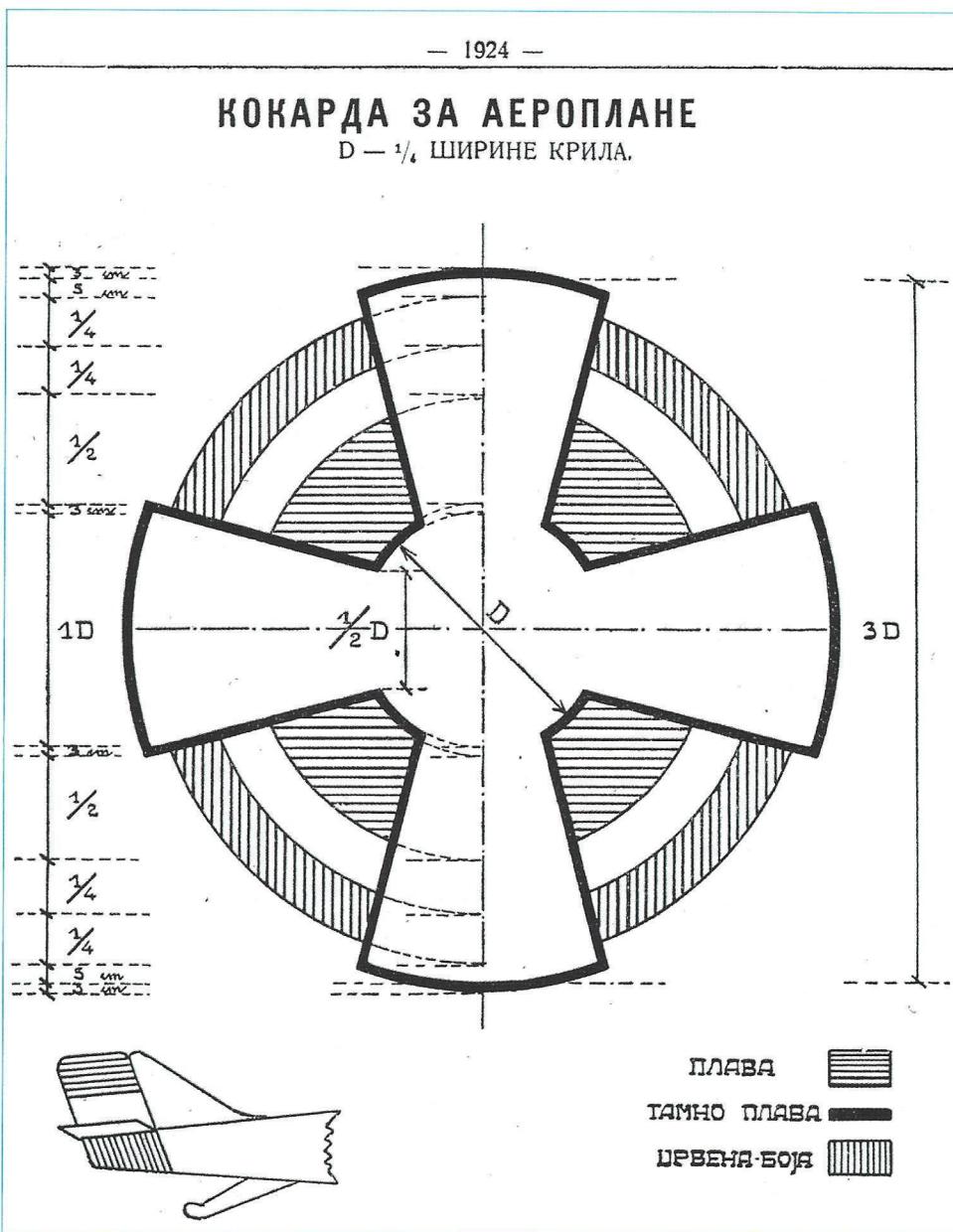
the beginning of February 1913 received national tri-colour flags on the vertical stabilizers and below the wings. The flag spanned from the wing tip to mid span of each wing, with colours arranged in the direction of flight with Red first, then Blue and finally White on the trailing edge. The Serbian and Montenegrin soldiers on the ground were delighted at the sight of wings painted in the colours of the Serbian flag (the Kingdom of Montenegro used the same flag colours).

In July 1915 at Požarevac, one of the two Serbian Bleriot XI-2s, the so-called "Oluj" (the other one called "Vihor"), allegedly carried a French cockade modified by painting a Blue circle inside of it which was widened across the White ring. This became an unofficial Serbian Air Force marking during the first two years of World War I. This marking was also carried by MF-11 aircraft from *Escadrille MFS.99* who were tasked with the reconnaissance of Bulgaria, before this country entered the war. Serbian pilots who flew within French *escadrilles* at the Salonika front carried standard French insignia however, this did not prevent individual Serbian pilots from decorating them with Serbian symbols, such as cockades or King Peter I's monogram. Some of the national cockades were painted around bullet holes, similar to the French manner at the time. *Ppor* Miodrag Tomić, on his own accord had a Serbian tri-colour flag painted on the side of the fuselage, which was later adopted in the entire *Escadrille AR.521*. In accordance with the order by the French general Louis Franchet d'Espèrey ahead of the Salonika front breakthrough, as of 20 July 1918, all French cockades were to be replaced with those in Serbian colours within all Serbian *escadrilles*.

On 17 August 1918 the final appearance of the cockade was proposed with, centre to outward, Red/Blue/White and this was finally accepted following an official order from 20 August. Half of the fields were to be Red and  $\frac{1}{4}$  each Blue and White. All aircraft were ready for action over the Salonika front

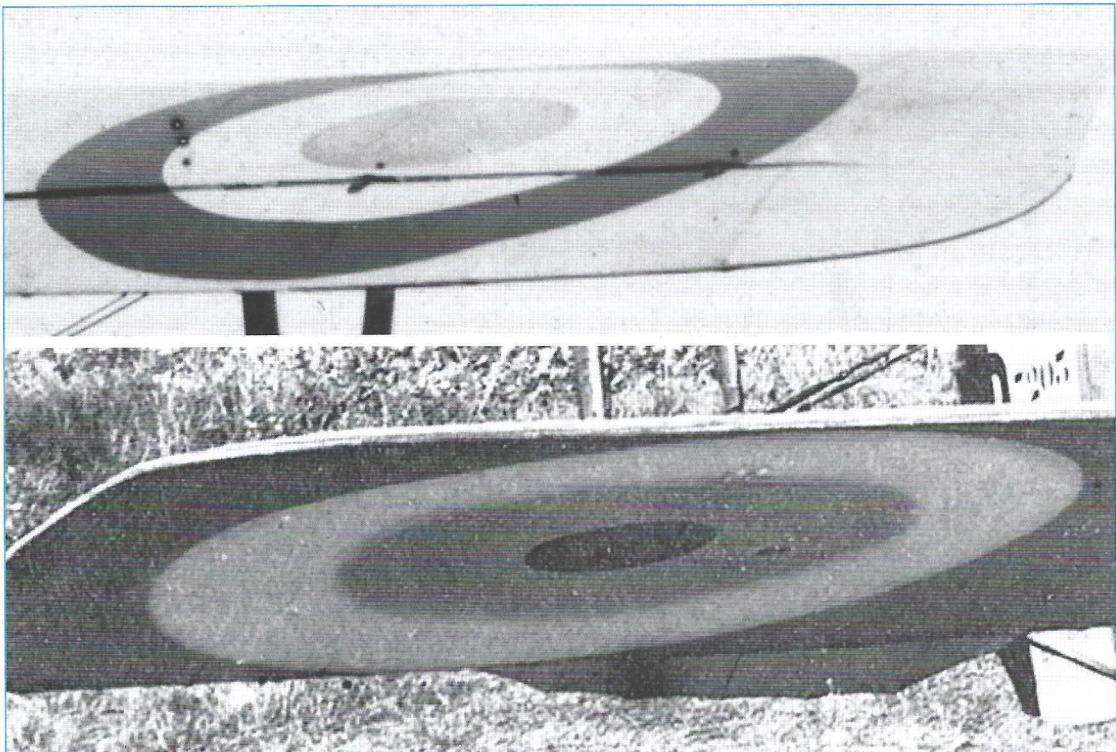


Document of the Ministry of War and Marine dated 17 January 1921 shows the shape and position of the new Yugoslav chevron insignia (top to bottom): a/ wings, b/ rudder, v/ fuselage. Note the originally presented chevron on the rudder instead of the officially adopted standard state flag. (Zmago Jelinčič)

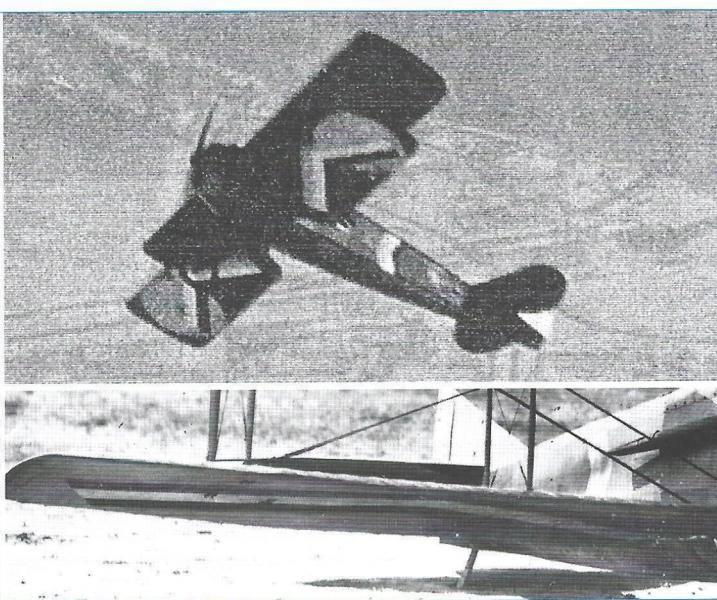
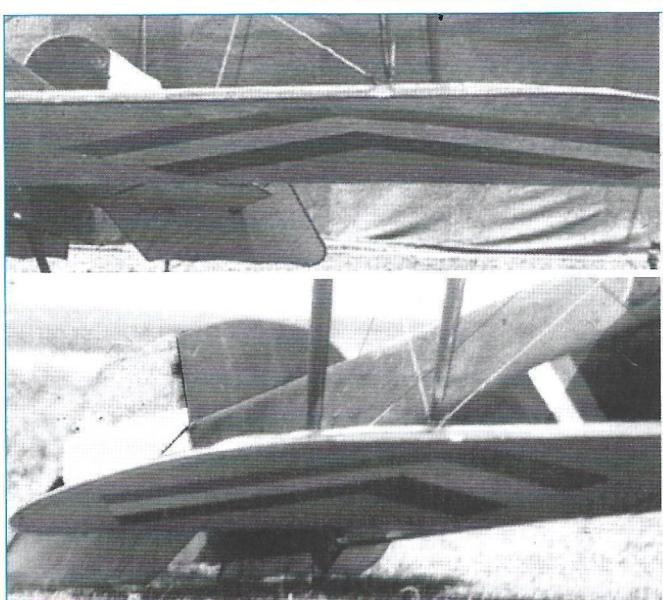
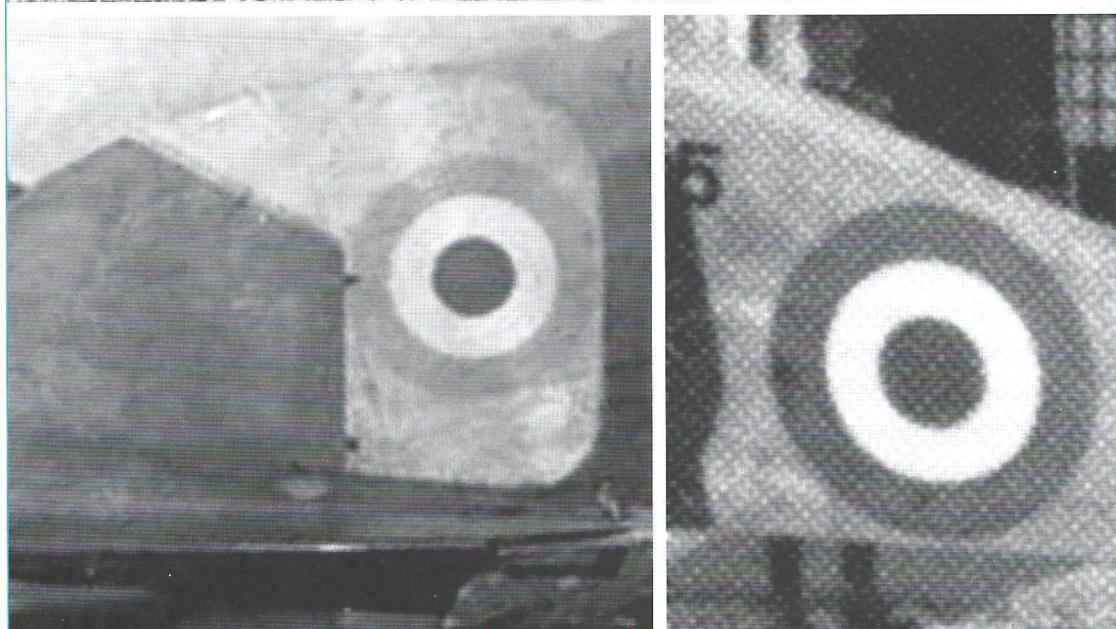


Official instruction from 1924: кокарда за аероплане (Aeroplane cockade), commonly known as „косовски крст” (“Kosovo cross”).

*Early insignias in roundel style: (top) original French cockade; (mid) Serbian cockade with Serbian colour layout; (bottom left) RAF style roundel; (bottom right) French style roundel.*



*Interim chevron insignias used in the first post World War I period: (left) on Phönix D and (right) on Spad fighters.*



which began with a breakthrough on 14 September 1918, however some of them did not follow the required colour ratio and instead colours were applied over standard French markings. Some aircraft even had mixed French and Serbian markings. The first aircraft to receive new markings was the Spad VII flown by *kap I* Branko Vukosavljević, commanding officer of 1<sup>st</sup> Serbian *Escadrille*.

Following the arrival of *Escadrille*'s aircraft at Novi Sad, its aircraft along with some captured ones had the tail flags changed to Serbian style ones. Still, some aircraft remained with both French and Serbian cockades.

During the first post war years, the aircraft of French origin remained with French markings on the wings while the tail surfaces had the Yugoslav horizontal tri-colour painted on. The French inscriptions usually remained. The war-trophy Austria-Hungary aircraft had most changes implemented in order to cover the former enemy's markings and apply those of the new country. German aircraft were treated in a similar manner to those from Austro-Hungarian. These transitional markings were usually improvised and applied quickly to cover the existing markings in their entirety, which resulted in thin, poor quality, coats.

With the proclamation of the KSHS, the aircraft appeared with the new Yugoslav flag on the tail surfaces, which became the standard practice for the years to come. French cockades gradually changed to the newly introduced interim Yugoslav national insignia, in the form of three-colour chevrons on the wings and sometimes on the fuselage sides. The same insignia was applied on some captured machines.

On 28 May 1924 with "Уредба о ознакама" (Markings Regulation), a new insignia, the so-called "Kosovo cross" (косовски крст), was introduced along with the adoption of the state three colour flag on the rudder. As a result of this regulation, all markings applied to date, that is the transitional markings, were invalidated.

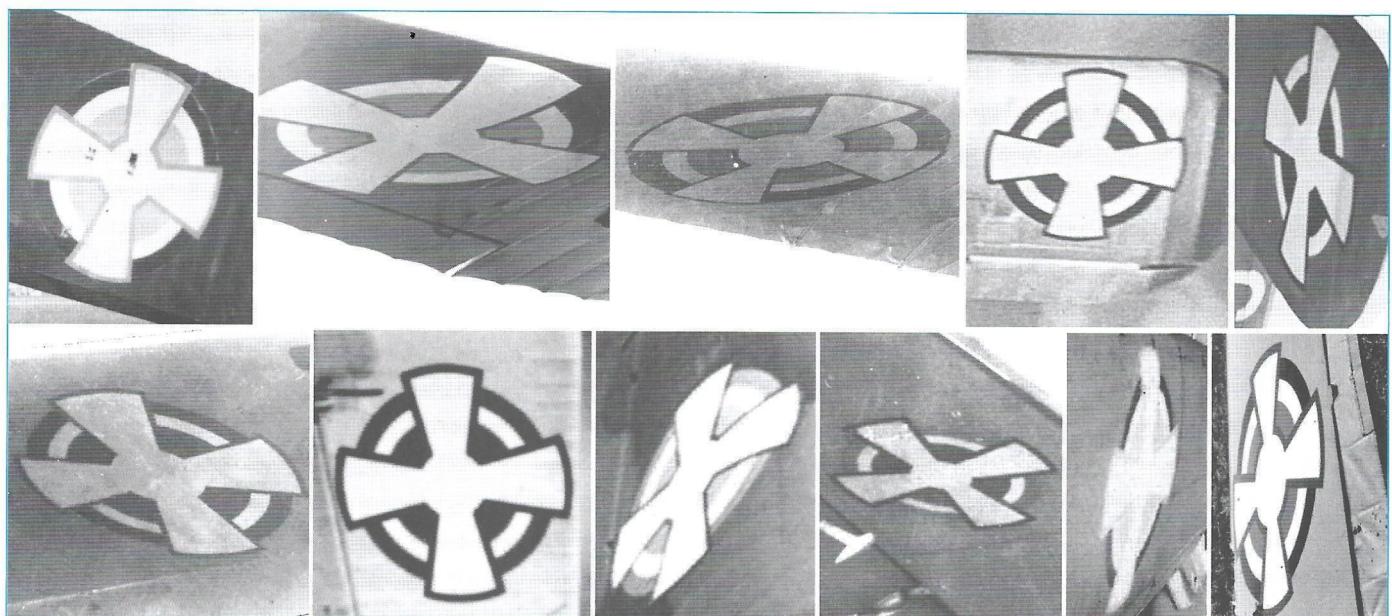
The "Kosovo cross" insignia was applied on the wing topsides and undersides and was defined in overall size as  $\frac{3}{4}$  of the wing chord. The inner White circle had a diameter measuring  $\frac{1}{4}$  wing chord. Each side of the cross had a  $\frac{1}{4}$  chord length and it protruded 5 cm past the Red ring. The Blue ring measured  $\frac{1}{2}$  chord and the Red  $\frac{1}{4}$  chord. The cross itself was outlined with Dark Blue, 3 cm wide. Since the aircraft differed in wing chord, this complicated matters, which necessitated custom markings to be created for each type. For 18 years, the "Kosovo Cross" underwent many minor differences, including dimension, form and colour changes.

Before the 1941 April War, due to the worsening situation (since early 1940), the diameter of the "Kosovo cross" was reduced to a "small" size measuring 60 cm or less in diameter, according to the aircraft type. There were exceptions to this rule as can be seen in the individual type photographs. VV was one of the first to use the asymmetric marking system, with one "small" size insignia on top of the port wing and one "large" size below the starboard wing. As an exception to this standard, insignia were sometimes applied on top of the starboard and below the port wing or on top of the port and below both wings. During repainting of older aircraft types, both underside insignia often remained unchanged. The flags on the rudder were either reduced to stripes or were entirely omitted.

#### Air base insignia

To differentiate between aircraft from different air bases, an air base code was applied in large Latin letters  $\frac{3}{4}$  wing chord tall and  $\frac{1}{2}$  chord wide at the very end of the wings. Monoplanes had these insignia applied on the wing undersides, while biplanes with uneven wingspan had them applied on the underside of the top wings and those with even wing span on the underside of the bottom wings. White codes

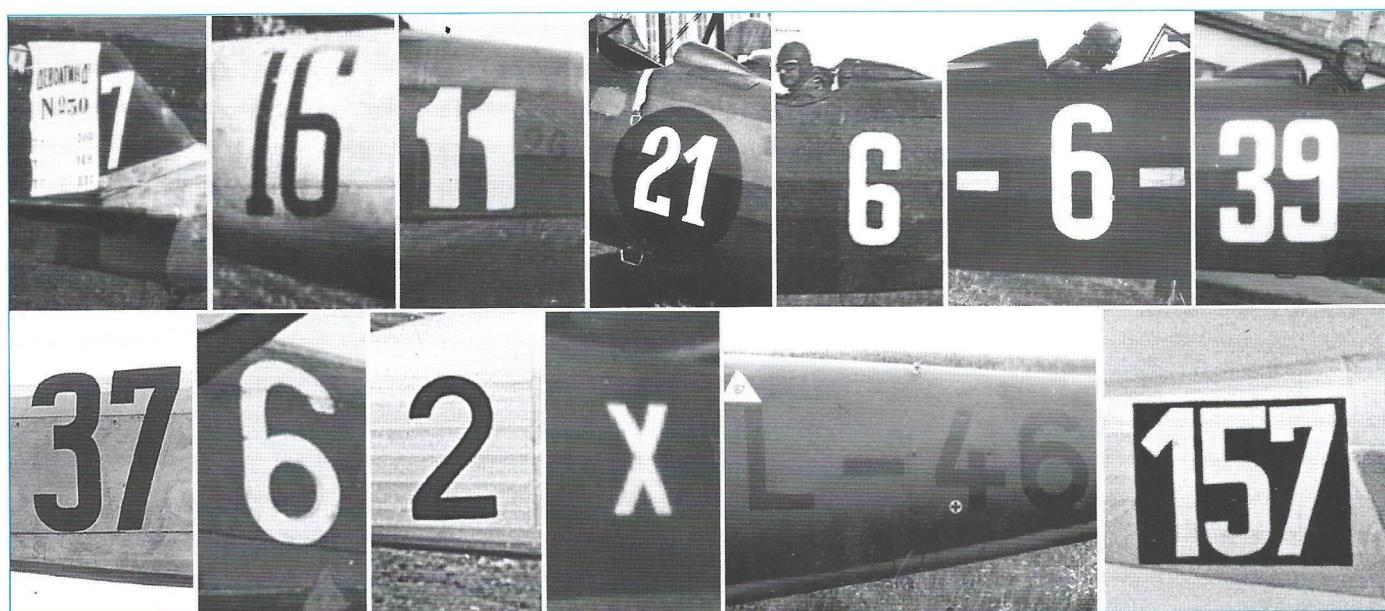
During the period between 1924 and 1941, standardised "Kosovo cross" had many minor modifications, while keeping the basic form.

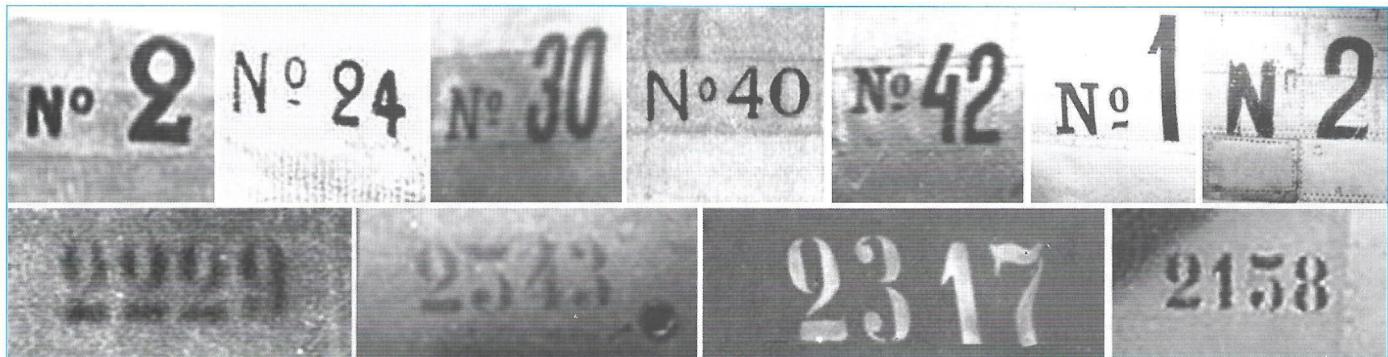




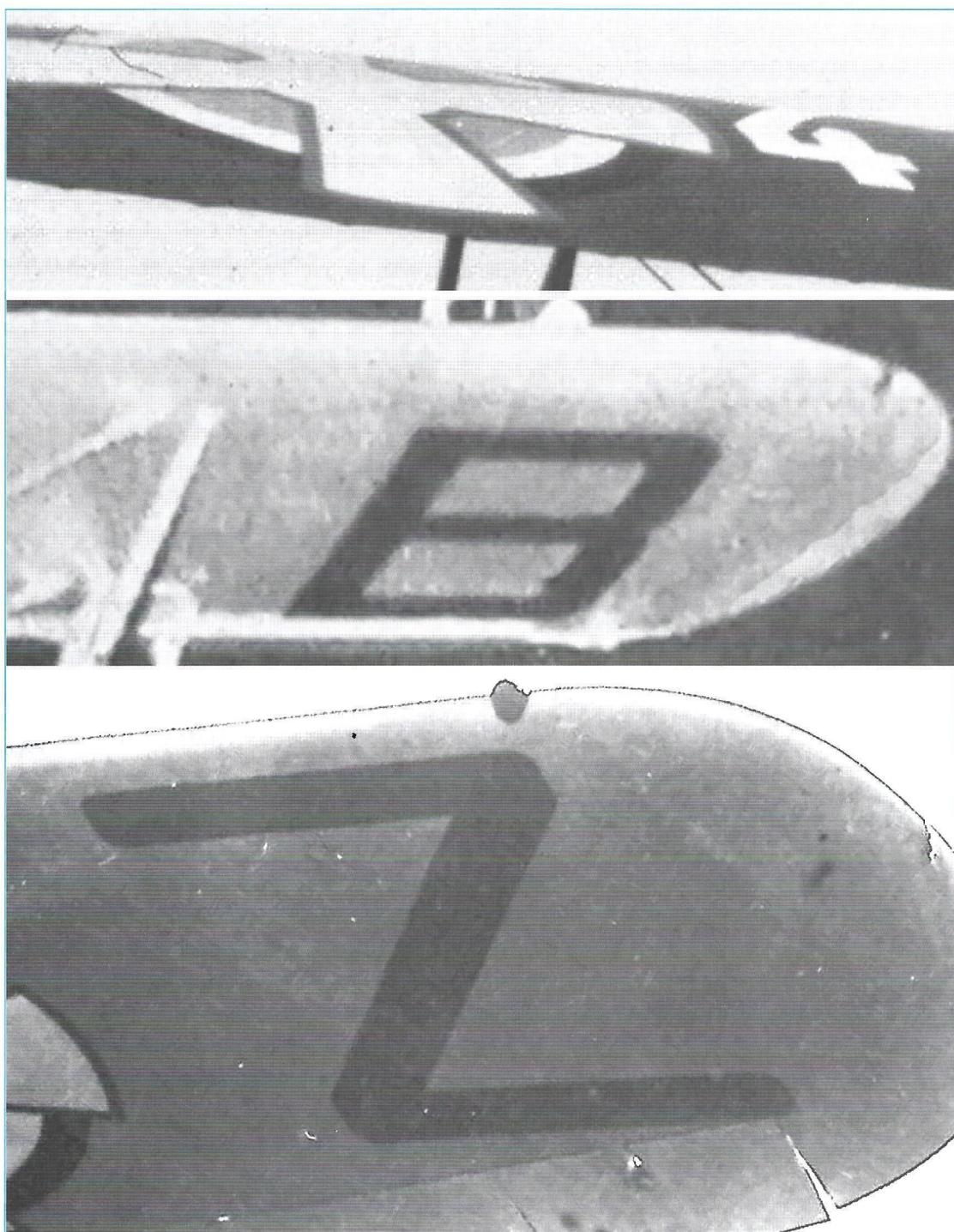
Standardized rudder markings and inscriptions 1918-1941, left to right: (top row) Nieuport 24, Spad S.7 (both with standard French markings), Spad S.7, Phönix D.IIa (both with early V KSHS rudder markings), Dewoitine D.1bis (original French factory markings), two D.1 C1s (two styles of markings); (mid row): Dewoitine D.9, Dewoitine D.27 (Zmaj-built), two Avia BH-33Es (imported and Ikarus-built), two Furies (imported and Ikarus-built), series Ikarus IK-2; (lower row): Rogožarski IK-3 prototype, Messerschmitt Me-109, two series IK-3s (without and with EvBr), two Zmaj-built Hurricanes, Zmaj R-1.

W codes, mainly on the fuselages, left to right: (top row) Dewoitine D.1 tail, D.27, Potez-Hispano, four BH-33Es (rare code on Black circle, two competition numbers and standard code); (bottom row): two Furies (Black on Silver and White code on camouflaged aircraft), IK-2, Hurricane (Roman numeral), Me-109 (special L code, lovac – fighter), Fury Mk.I (White code on Black rectangle for trainers).





Fuselage serial number, left to right: (top row) Spad S.7 (the first type of s/no), four Dewoitine D.1s (note different fonts), two Dewoitine D.9s (different fonts); (bottom row) Fury, Me-109, Hurricane, IK-3 (all similar to French-style fonts).



Numbers and letters on the wings (top to bellow): competition number repeated on BH-33E wings; Black B (for Belgrade) under the top wing of Fury; Black Z (for Zagreb) under the wing of IK-2.

were applied on darker coloured surfaces while Black ones were applied on light coloured surfaces and those in natural Aluminium. This practice was discontinued after 1938.

Unit	Code	Airbase
1.VP	N	Novi Sad
2.VP	R	Rajlovac – Sarajevo
3.VP	S	Skoplje
4.VP	Z	Zagreb – Borongaj
5.VP	M	Medoševac – Niš
6.VP	B	Beograd – Zemun
7.VP	J	Jasenica – Mostar
VŠG	C	Bela Crkva
VTZ	K	Kraljevo

#### Code numbers

Individual aircraft numbers (so-called “escadrille numbers”) were assigned at the unit level, with only the shape and size kept constant between the units. Usually White numbers were applied across darker surfaces while Black ones were applied across lighter surfaces. During competitions, aircraft were assigned on some occasions temporary competition numbers which were applied on the fuselage and the wings.

#### Unit insignia

Unit insignia were at first applied provisionally, however after the regulations were issued these were standardized as different colour triangles, circles, squares and other geometric shapes.

#### Serial numbers

Aircraft operated between 1912 and 1915 either retained the number applied by the supplier, or were left un-numbered. During the period between 1916 and 1918 the French Air Force numbering system was used (manufacturer construction numbers or STAé assigned series numbers). After World War I, aircraft initially retained their existing identities – whether French, Austro-Hungarian, Italian, German or the manufacturers. Around 1925 an official serial numbering system was introduced. Each aircraft type was allocated a batch of military serial numbers starting at №1. The first aircraft types with such series numbers were Spads (after repairs in 1924-1925) and the new Dewoitine D.1 C1 fighters. There were no “black-out” blocks to disguise the total number acquired, unlike in some other countries. In some cases serial numbers (№) were allotted to several types in a continuous string.

#### EvBr (Army Evidence numbers)

The new military aircraft registry was established at the end of 1938 (introduced with the arrival of the Hurricane), with each aircraft obtaining its unique EvBr. Each string started at 1 (or 51, sometimes 71, if the batch was expected to be small) and increasing sequentially. “Black-out” blocks did not exist.

The tail surfaces or fuselage sides of each aircraft were where the EvBr was applied. The first digit designated the purpose, the second the aircraft type whilst the third and fourth designated the aircraft individual number.

EvBr were implemented with the following rules:

Number (EvBr) range	Aircraft type
Up to 1000	Training
1001 to 2000	Reconnaissance
2001 to 3000	Fighter
3001 and over	Bomber

Number range	Fighter type
2001+	Avia BH-33
2071+	Potez 63
2101+	Ikarus IK-2
2151+	Rogožarski IK-3
2201+	Hawker Fury
2301+	Hawker Hurricane
2501+	Messerschmitt Me-109

### Aircraft data inscriptions

All VV aircraft carried standard tail inscriptions, which consisted of six rows (aircraft type, s/n and four aircraft weights) applied over both sides of the large tail flag. Serbian Cyrillic letters were normally used, except for aircraft names in some cases.

When the flag was reduced or removed, inscriptions were applied over the camouflaged surface on the port side of the rudder or the vertical tail plane. After 1938, inscriptions were changed to five rows (type, s/n and three weights) and applied in Latin letters.

### Manufacturer's markings

Manufacturer's markings, typically in the form of a logo or a name, were applied on the vertical stabilizer or the rudder.

### Service inscriptions

Service inscription LIFT HERE, in the beginning as French *LEVER ICI* and from 1925 in Serbian Cyrillic *ДИЖИ ОВДЕ*, was applied on the fuselage. On reconnaissance machines of French origin an often used title was PHOTO. Depending on the type, manufacturer or country of origin, different small stencils were applied on the airframes. The inscription *НОЧНО ОСВЕТЛЕЊЕ* (night lighting) was applied on aircraft which were capable of and equipped for night flights.

### V KSHS and VV Aircraft Weights

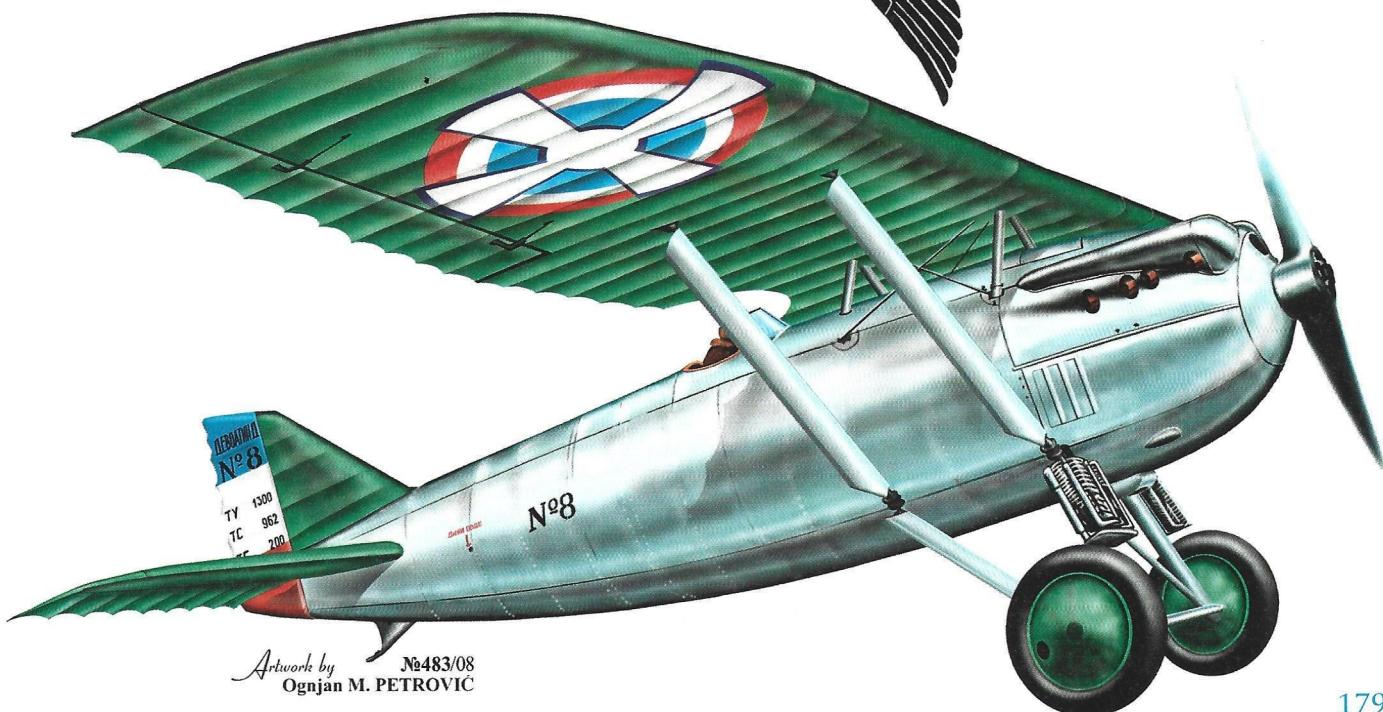
Original	Abb.	Weights		Note
Poids Utile	P.U.	Useful weight		French style
Poids Combustible	P.C.	Fuel (and oil) weight		(Spad, D.1bis)
тежина целокупна	Т.Ц.	Loaded weight		
тежина укупна	Т.У.			
тежна сопствена	Т.С.	Empty weight		
тежина горива	Т.Г.	БЕНЗИНА ЗЕЈТИНА	Fuel	Gasoline
				Oil
тежина корисна	Т.К.	Useful weight		
LEERGEWICHT	-	Empty weight		
NORM. BETRIEBSTOFF	-	Normal Fuel and oil		
NORM. NUTZLAST	-	Normal useful weight		LFT style (captured aircraft)

\* Abbreviations often applied without full stop.

ДЕВОЈАТИН.Д.



Dewoitine D.1 C1 №8,  
1.VP, V KSHS, airfield Novi  
Sad, 1928.



## Appendix 2. Camouflage and Colours

During World War I, the first Serbian aircraft of French origin carried standard wartime camouflage used by the French Air Force. Clear varnish was the first type of overall finish used on almost all aircraft in the period before World War I, and it was also common in the first two war years. In KSHS, it was retained on some aircraft until the mid 1920s. The aircraft painted in this manner were in the colour of the material of construction, such as fabric or wood, and Aluminium parts were usually painted in a Dark Grey or Black protective coat. Varnished fabric had a characteristic dirty Yellow or pale Cream colour. It also varied depending on the type of fabric and varnish used. One of the first French camouflages used during the first half of World War I, had the appearance of a metallic Light Grey or Light Blue-Grey colour. The colour shade varied depending on the surface it was applied to. In 1914 the French military introduced an overall Ochre colour. In V KSHS, Spad 180 KS and 220 KS were painted in this camouflage. More complex French camouflage, a multi-colour one with numerous iterations, first appeared in 1915. The top surfaces were painted in standardized mottles with three, four or five standard French military aircraft colours of the period. The lower surfaces were usually overall Light Tan, however some fighters had metallic undersurfaces. Nieuports 24 C1 and 27 C1s, as well as both the Spad 7 C1 and 13 C1, carried this camouflage. It is important to note that the French added between 30% to 40% Aluminium powder, which resulted in a specific appearance. Following the war, the same colours were used without the Aluminium content. A special variation of the French multi-colour camouflage had the aircraft painted primarily overall Ochre, with a few mottles only in chestnut Brown. It was only used on Spad fighters.

Following the end of the Great War, captured Austro-Hungarian and German aircraft were impressed into service with their wartime camouflage. Captured LFT aircraft flew in KSHS for some time following the war with the original two-tone camouflage, which on the topsides consisted of large Medium/Dark Green mottles and Ochre, while the undersides were only varnished. In some instances, instead of Ochre on the fuselage, there was varnished wood. Three versions of this camouflage existed: with sprayed-on transition between the colours, with small curling transition and sometimes small mottles of Light Grey over the base wood with gradual transition or border between the colours. These colours were used on the Phönix D.I as well as the Aviatik D.I Berg. Captured LFT Naval Phönix D.IIAs were used for some time after the war in overall Grey camouflage. Some LFT aircraft overall coated in varnish had the topsides and fuselage sides with sponge or spray applied mottles in Green or Green and Brown. Some aircraft had only these mottles on the fuselage, while some had them applied overall. These aircraft were painted at the factory in this manner, however this was not applied on initial batches hence this camouflage was in some instance applied in field conditions. As a result, some aircraft had c/n or factory numbers painted over. Aircraft painted in this camouflage were Albatros D.III Oef, Phönix D.I and D.II and Aviatik D.I Berg.

The period in the early 1920s was very interesting due to the variety of aircraft in service, which originated from many different countries, thus sporting all sorts of camouflage and markings. This lasted until 1924, when standard camouflage and markings were introduced. At the same time, the introduction of new French aircraft began along with the beginnings of a domestic aviation industry, which produced both domestic and licence-built aircraft. Until the end of the 1920s, the French camouflage style was predominant in VV. Almost all captured aircraft, which underwent overhaul in the KSHS in the 1920s, continued their service with the new Light Grey-Blue colour. They wore this camouflage until the end of their service, some as late as the end of the 1920s. The fighter aircraft painted in this manner were Albatros D.III and various versions of Phönix, Aviatik Berg and Spads. Aluminium-Green camouflage was inherited from the French during the purchase of Dewoitine D.1 C1 and D.9 C1 fighters. All fabric surfaces were painted in Green while the fuselage remained in polished Aluminium. A specific translucent Green colour was used in this time period by both the Dewoitine and Morane factories.

Beginning in the 1930s, imported fighter aircraft from the Czechoslovak Republic, Great Britain and Germany brought the introduction of camouflage used in the Československe letectvo, RAF and *Luftwaffe* respectively. Aluminium (Silver) was a very frequent scheme in the interwar period, hence it was used on Yugoslav aircraft for almost two decades. The first version was applied on mixed construction aircraft, where the metal parts remained in natural Aluminium, while the fabric and other parts were painted Silver. This camouflage first appeared in V KSHS at the beginning of the 1920s. It was applied on the Dewoitine D.27 C1, Hawker Fury Mk. IA, Yugoslav Fury and Ikarus IK-2 fighters. The second version was applied on aircraft of all-metal construction, where the entire aircraft was in the colour of natural Aluminium. This was the case with twin-engine Potez 630/631 C3 fighters. Gradually, the Silver/Aluminium colour was supplemented with *Sivo-maslinasta boja* (SMB – Grey-Olive) as it was officially known, which was in essence a shade of Green. Multiple colour variations appeared, which could have stemmed from the fact that paints from different suppliers were used. The imported aircraft from France wore Light Olive (which was in Yugoslav documents listed as Khaki) which was used by the French aircraft manufacturers until 1934. The first fighter aircraft to use this colour was the Potez 25A2

(Potez-Hispano, interim two-seat fighter), while Spads acquired this camouflage during overhaul in the country. Domestically produced aircraft under licence (like the Ikarus-built BH-33Es) used the same, but somewhat darker, colour, which is not fully defined. The domestic designed aircraft used a paint with an Olive tint which first appeared in the 1930s.

Following the Munich conference in 1938, as the prospect of war became obvious, most European countries applied wartime camouflage to their aircraft. The first such camouflage in KJ was overall Green, which was painted on the upper surfaces while the undersurfaces were Light Blue-Grey or Silver dope. There were several different variations, one was the Czechoslovak Green used by the Avia factory between 1926 and 1938 on Avia BH-33E fighters. A domestic Green was used on locally-built Avia BH-33Es, and was similar to the SMB colour, while the undersides of the said aircraft were painted Blue-Grey. The first aircraft in VV service considered to be camouflaged was actually one Yugoslav Fury, in 1938. VV at first applied a two-tone scheme patterned after RAF practice. RAF combat aircraft camouflage consisted of the upper surfaces painted in Dark Earth and Dark Green, with two different versions, "Scheme A" and "Scheme B". The two were mirror opposites. These were applied on Hawker Hurricane Mk.IIs delivered from the UK. The undersides either remained Silver or on some aircraft the wings were painted in Black and White. *Schwarzgrün* RLM 70, a German Black-Green colour, was one of the standard *Luftwaffe* colours, which was applied on the upper surfaces of Me-109s while the undersurfaces were painted in *Hellblau* RLM 65, Light Blue. The most elaborate camouflage worn by VV aircraft was a three-tone camouflage like the one used by the *Armée de l'Air*. This was carried on the Rogožarski IK-3, Ikarus IK-2, two overhauled BH-33Es in 1940-1941 and license-built Hawker Hurricane fighters, and it consisted of fine sprayed, soft edge Dark Green, Dark Brown and Ochre Yellow fields. Undersurfaces were mainly painted in Light Blue-Grey.

### Appendix 3. Yugoslav Fighter aircraft Types 1918-1941

Introduced in service Manufacturer	Original aircraft type and name	Aircraft type in V KSHS and VV service	Number of engines, factory, type and power in mhp/(m)	Note	Quantity
1918 Nieuport	Type 24; Nie 24 C1; Nie XXIV C1	Nieuport-120 KS	1 Le Rhône 9Jb 120	ex-SA	10
1918 Nieuport	Type 27; Nie 27 C1; Nie XXVII C1	Nieuport-120 KS	1 Le Rhône 9Jb 120	ex-SA	
1918 SPAD	S.VII C1; S.7 C1	Spad-180 KS	1 Hispano-Suiza 8Ab 180	ex-SA + purchased	27
1919 SPAD	S.XIII C1; S.13 C1; SPAD HS 220 HP	Spad-220 KS	1 Hispano-Suiza 8Be 220	purchased	5
1925 SPAD	S.XIII C1 (mod); S.13 C1 (mod)	Spad-180 KS	1 Hispano-Suiza 8Ab 180	modified to 8Ab engine by V KSHS	conv ?
1918 Albatros	D.III Ba.53.2 (Oef)	D.3; "de-3"; "de-drei"; Efag D.3; Albatros	1 Austro-Daimler AD6 185	ex-LFT; built by OEFFAG	1
1918 Albatros	D.III Ba.253 (Oef)	D.3; "de-3"; "de-drei"; Efag D.3; Albatros	1 Austro-Daimler AD6 225	ex-LFT; built by OEFFAG; 9 complete wings built by Rogožarski in 1925.	17+
1921 Albatros	D.III Ba.253 (Oef) (mod)	"de-drei"-Hiero; Efag D.3-Hiero	1 Hiero Type H IV 230	ex-LFT; modified to 230 mhp Hiero engine by V KSHS	conv 3
1925 Albatros	D.III Ba.253 (Oef) (mod)	D.3; "de-3"; Efag D.3; Albatros D.III 200 KS	1 Austro-Daimler AD6 200	ex-LFT; modified to 200 mhp AD by V KSHS	conv ?
1925 Albatros	D.III Ba.253 (Oef) (mod)	D.3; "de-3"; Efag D.3; Albatros D.III 185 KS	1 Austro-Daimler AD6 185	ex-LFT; modified to 185 mhp by V KSHS	conv ?
1918 Phönix	D.I Ba.128	Feniks-Hiero 200 KS	1 Hiero Type H 200	ex-LFT	10+
1921 Phönix	D.I Ba.228	Feniks - Hiero 200 KS	1 Hiero Type H 200	ex-MLW (Klasse J ), nicknamed "Phönix-Jäger"	
1918 Phönix	D.II Ba.122	Feniks - Hiero 200 KS	1 Hiero Type H 200	ex-LFT	
1921 Phönix	D.IIa Ba.422	Feniks - Hiero 230 KS	1 Hiero Type H IV 230	ex-MLW (Klasse J ); minor modifications by V KSHS	

1918	Aviatik	D.I (Berg) Ba.38	Berg-185 KS	1 Austro-Daimler AD6 185	ex-LFT; all D.Is nicknamed "Berg-Einsitzer" by LFT	22+
1918	Aviatik	D.I (Berg) Ba.138	Berg-200 KS	1 Austro-Daimler AD6 200	ex-LFT	
1918	Aviatik	D.I (Berg) Ba.238	Berg-160 KS	1 Austro-Daimler AD6 160	ex-LFT	
1918	Aviatik	D.I (Berg) Ba.338	Berg-225 KS	1 Austro-Daimler AD6 225	ex-LFT	
1918	Aviatik	D.I (Berg) Ba.284 (WKF)	Berg-160 KS	1 Austro-Daimler AD6 160	ex-LFT; built by WKF	
1918	Aviatik	D.I (Berg) Ba.92 (MAG)	Berg-200 KS	1 Austro-Daimler AD6 200	ex-LFT; built by MAG	

1919	Ansaldo	SVA-5	Ansaldo	1 S.P.A. 6a 220	ex-Aviazione Militare	1
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1923	Bristol	F2B Fighter; Brisfit; Bristol-Fighter	Bristol-Hispano	1 Hispano-Suiza 8Fb 300	factory designation Type 17; V KSHS sample type	1
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1924	Dewoitine	D.1 C1	Devoatin D1 C1; D1; Devoatin-Hispano	1 Hispano-Suiza 8Fb 300	factory designation D.1bis; pre-series N°6	1
1926	Dewoitine	D.1 C1	Devoatin D1 C1; D1; Devoatin D <sup>1</sup> ; DC; Devoatin-Hispano; Devoatin-300 KS	1 Hispano-Suiza 8Fb 300	factory designation D.1ter; major modifications by Ikarus	44
1934	Dewoitine	D.1 K-7	D.1 C1-K7; D1-K7 420 KS	1 Gnôme-Rhône 7Kse Titan Major 420	modified to GR engine by Zmaj	conv 1

1926	Dewoitine	D.9 C1	Devoatin D9 C1; D9; Devoatin-Jupiter	1 Gnôme-Rhône Jupiter 9Ad 420	minor modifications; later to IAM Jupiter engine	6
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1928	Dew./EKW	D.27	D.27; Devoatin Džokej; Džokej-Hispano; Devoatin-Hispano 500 KS	1 Hispano-Suiza 12Mb 500	prototype; nickname "Jockey"	1
1929	Dew./EKW/Zmaj	D.27 C1 Jockey		1 Hispano-Suiza 12Mb 500	built by Zmaj; nickname Jockey	3

1929	Avia	BH-33E SHS	Avia B.H.33; BH.33; BH 33 C; Avia; Avia-Jupiter; Avia-Jupiter 420 KS	1 Walter Jupiter VI 450	3 for air races + 1 replacement; later to 420 mhp IAM 9Ad	4
1931	Avia	BH-33Y		1 Walter Jupiter VI 450	imported series; later to 420 mhp IAM 9Ad Jupiter	20
1934	Avia/Ikarus	AVIA BH33		1 IAM 9Ad Jupiter 420	Ikarus built domestic series	22

1927	Potez	Potez 25 A2; XXV A2; P.25	Potez-Hispano; Potez 25-Hispano	1 Hispano-Suiza 12Ha 450	factory designation 25.20 (A2); interim fighter C2 class	15
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1931	Hawker	Fury Mk.IA; Fury Series IA	Fjuri; Fjuri-Rols Rojs	1 Rolls-Royce Kestrel IIS 525		2
1931	Hawker	Fury Mk.IA (mod.)	Fjuri; Fjuri-Hispano	1 Hispano-Suiza 12Nb 650	Mk.I modified to HS engine by Hawker at VV request	1
1936	Hawker	Yugoslav Fury Mk.II Yug. Fury Series II		1 Rolls-Royce Kestrel XVIS 700/4420 m	imported series	10
1937	Hawker/Ika.	Hawker Fury	Hoker-Fjuri; Fjuri Fjuri series II; Fjuri	1 Rolls-Royce Kestrel XVIS 700/4420 m	Ikarus built series	24
1937	Hawker/Zmaj	Hawker Fury		1 Rolls-Royce Kestrel XVI 700/4420 m	Zmaj built series	16

1935	Ikarus	IK-L1	IK; IK-1; Ika-1; Ika prototip	1 Hispano-Suiza 12Ycrs 860/3100	prototype (BR.01)	1
1936	Ikarus	IK-02	Ika-2; drugi prototip (the second prototype)	1 Hispano-Suiza 12Ycrs 860/3100	prototype II (Br.02)	1
1938	Ikarus	IK-2 (I-K-two)	Ika-2; Ika 2; IK-2C (IK-2C)	1 Avia/Hispano 12Ycrs 860/3100	series	12

1938	Hawker	Hurricane Mk.I	Hoker Hariken; Hariken; Hariken Rols-Rojs	1 Rolls-Royce Merlin II 1044/4270	1 <sup>st</sup> imported party	12
1940	Hawker	Hurricane Mk.I		1 Rolls-Royce Merlin III 1044/4270	2 <sup>nd</sup> imported party	12
1940	Hawker/Zmaj	Hariken		1 Rolls-Royce Merlin III 1044/4270	1 <sup>st</sup> domestic series, built by Zmaj	24
1940	Hawker/Rog.	LVT-1 (Lovac- Vazduhoplovno- -Tehnički prvi)	IVT, Hariken Dajmler Benc; Hariken DB; Hariken-DB601A	1 Daimler-Benz 601Aa 1100/3700	prototype; Hurricane modified to 1100 mhp DB601 by Rogožarski	conv 1

1938	Rogožarski	I.K.-3 (IK-3)	Ika-3 prototip; Ilić-Sivčev I.K.3 (Ilitch-Sivtchev I.K.3)	1 Hispano-Suiza 12Y-29 925/3600	prototype (BR.1)	1
1940	Rogožarski	IK-3 (I-K-tri)	I.K.3; I.K.-3; IK3; IKA-3; IKA3; Ika-3	1 Hispano-Suiza 12Y-29 925/3600	series; VV nickname "Ika"	12
1940	Rogožarski	IK-3	IK-3 druga serija	1 Hispano-Suiza 12Y-29 925/3600	Br.2157 modified to 2 <sup>nd</sup> series standard, April 1941	conv 1

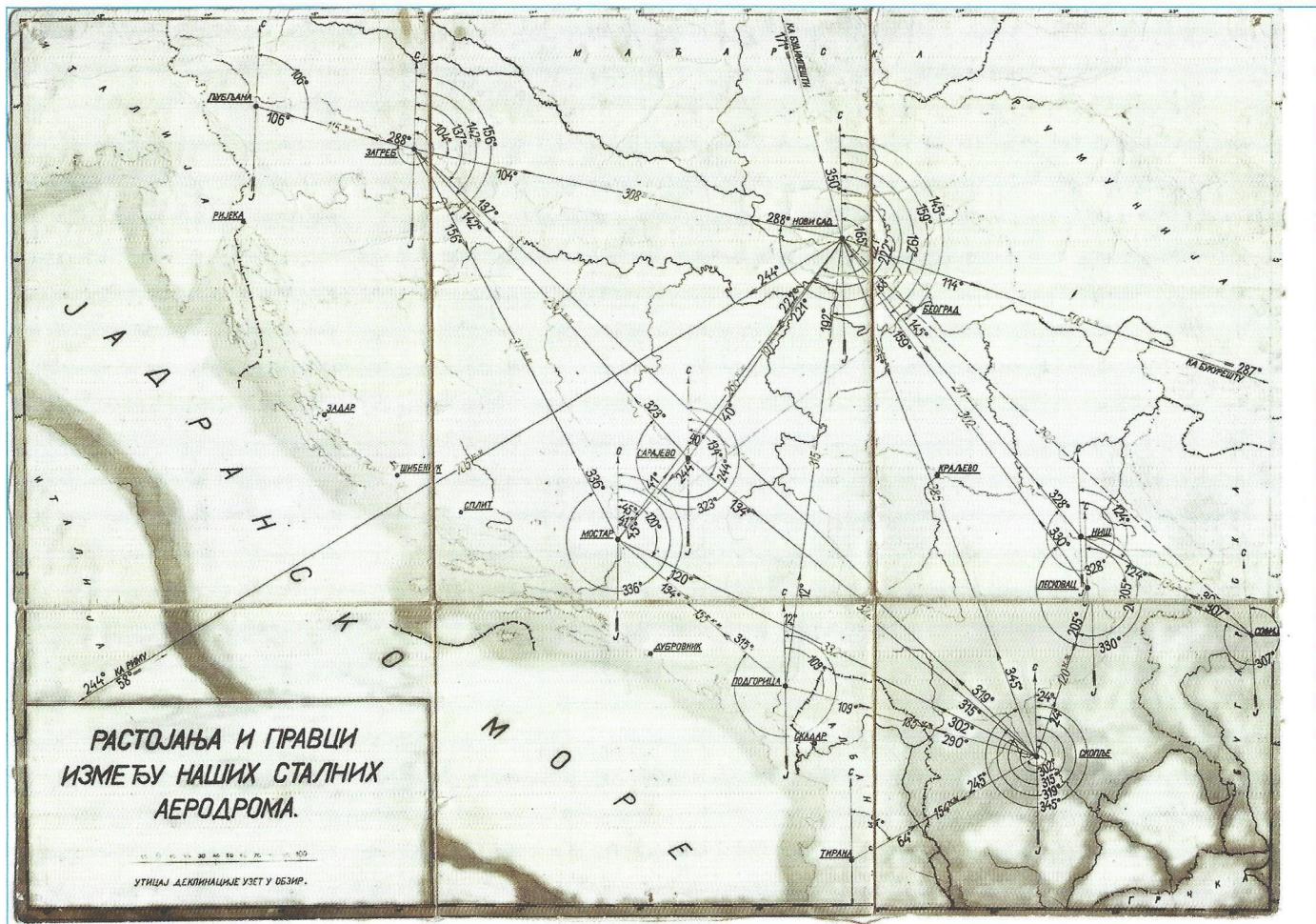
1939	Messerschmitt	Bf 109E-3a	Me-109; Me-109E; Me-109 DB 1100 KS	1 Daimler Benz 601Aa 1100/3700	Luftwaffe nickname "Emil"	73
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1939	S.N.C.A.N.	Potez 63 C-3 (Potez 630 C3)	Potez 63 C3; Potez 63 C-3; Potez 63	2 Hispano-Suiza 14Ab 02/03 680/3800	ex P.631 C3 N°01; ex P.63 N°1 (F-AREY) modified for Air Bleu; modified to P.630 C3 N°1Y (double command, HS)	1
1940	S.N.C.A.N.	Potez 63 C-3 (Potez 631 C3)		2 Gnôme-Rhône 14M 6/7 Mars 660/4000	P.631 C3 N°2Y	1

1941	Messerschmitt	Bf 110C-4	Me-110	2 Daimler-Benz 601A-1 1100/3700	ex-Luftwaffe; captured	1
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Researched & created by Ognjan M. Petrović, 2000/2019

## Appendix 4. Map of the Kingdom of Yugoslavia



An original pre-war pilot map showing the distances and directions between airfields in the KJ. (Aleksandar Ognjević)

## Appendix 5. Yugoslav Aviation Ranks

Vazduhoplovstvo vojske (VV)		Luftwaffe		Royal Air Force	
rank	abb.	rank	abb.	rank	abb.
армијски ќенерал	armijski djeneral	arm djen	General Oberst	GenOb.	Air Chief Marshall
дивизијски ќенерал	divizijski djeneral	div djen	General Leutnant	GenLt.	Air Marshall
ваздухопловни бригадни ќенерал	vazduhoplovni brigadni djeneral	vazd brig djen	General Major	GenMaj.	Air Vice Marshall
пуковник	pukovnik	puk	Oberst	Oberst	Group Captain
потпуковник	potpukovnik	ppuk	Oberstleutnant	OberstLt.	Wing Commander
мајор	major	maj	Major	Maj.	Squadron Leader
капетан I класе	kapetan I klase	kap Ik	Hauptmann	Hptm.	Flight Lieutenant 1 <sup>st</sup> class
капетан II класе	kapetan II klase	kap IIk	-	-	-
поручник	poručnik	por	Oberleutnant	Oblt.	Flying-Officer
потпоручник	potporučnik	ppor	Leutnant	Lt.	Pilot-Officer
наредник-водник I класе	narednik-vodnik I klase	nv Ik	Stabsfeldwebel	Stfw.	Flight Sergeant
наредник-водник II класе	narednik-vodnik II klase	nv IIk	Oberfähnrich	Obfhr.	-
наредник-водник III класе	narednik-vodnik III klase	nv IIIk	Oberfeldwebel	Obfw.	-
наредник I класе	narednik I klase	nar Ik	Feldwebel	Fw.	Sergeant
наредник II класе	narednik II klase	nar IIk	Unterfeldwebel	Ufw.	-
поднаредник I класе	podnarednik I klase	pnar Ik	Unteroffizier	Uffz.	Corporal
поднаредник II класе	podnarednik II klase	pnar IIk	Stabsgefreiter	Stgefr.	Senior Aircraftman
каплар	kaplar	kpl	Gefreiter	Gefr.	Airman 1 <sup>st</sup> Class
редов	redov	red	Flieger	Flg.	Airman 2 <sup>nd</sup> Class

According to VV service rule, non-commissioned officers who met the requirements for officer rank without completing the Military Academy were entitled to the rank of *vojno-tehnički činovnik* of various classes, which were equivalent to specific officer ranks:

виши војнотехнички чиновник I класе	viši vojnotehnički činovnik I klase	vvtč Iк	brigadni djeneral
виши војнотехнички чиновник II класе	viši vojnotehnički činovnik II klase	vvtč IIк	pukovnik
виши војнотехнички чиновник III класе	viši vojnotehnički činovnik III klase	vvtč IIIк	potpukovnik
виши војнотехнички чиновник IV класе	viši vojnotehnički činovnik IV klase	vvtč IVк	major
нижи војнотехнички чиновник I класе	niži vojnotehnički činovnik I klase	nvtč Iк	kapetan I klase
нижи војнотехнички чиновник II класе	niži vojnotehnički činovnik II klase	nvtč IIк	kapetan II klase
нижи војнотехнички чиновник III класе	niži vojnotehnički činovnik III klase	nvtč IIIк	poručnik
нижи војнотехнички чиновник IV класе	niži vojnotehnički činovnik IV klase	nvtč IVк	potporučnik

## Appendix 6. VV unit structures

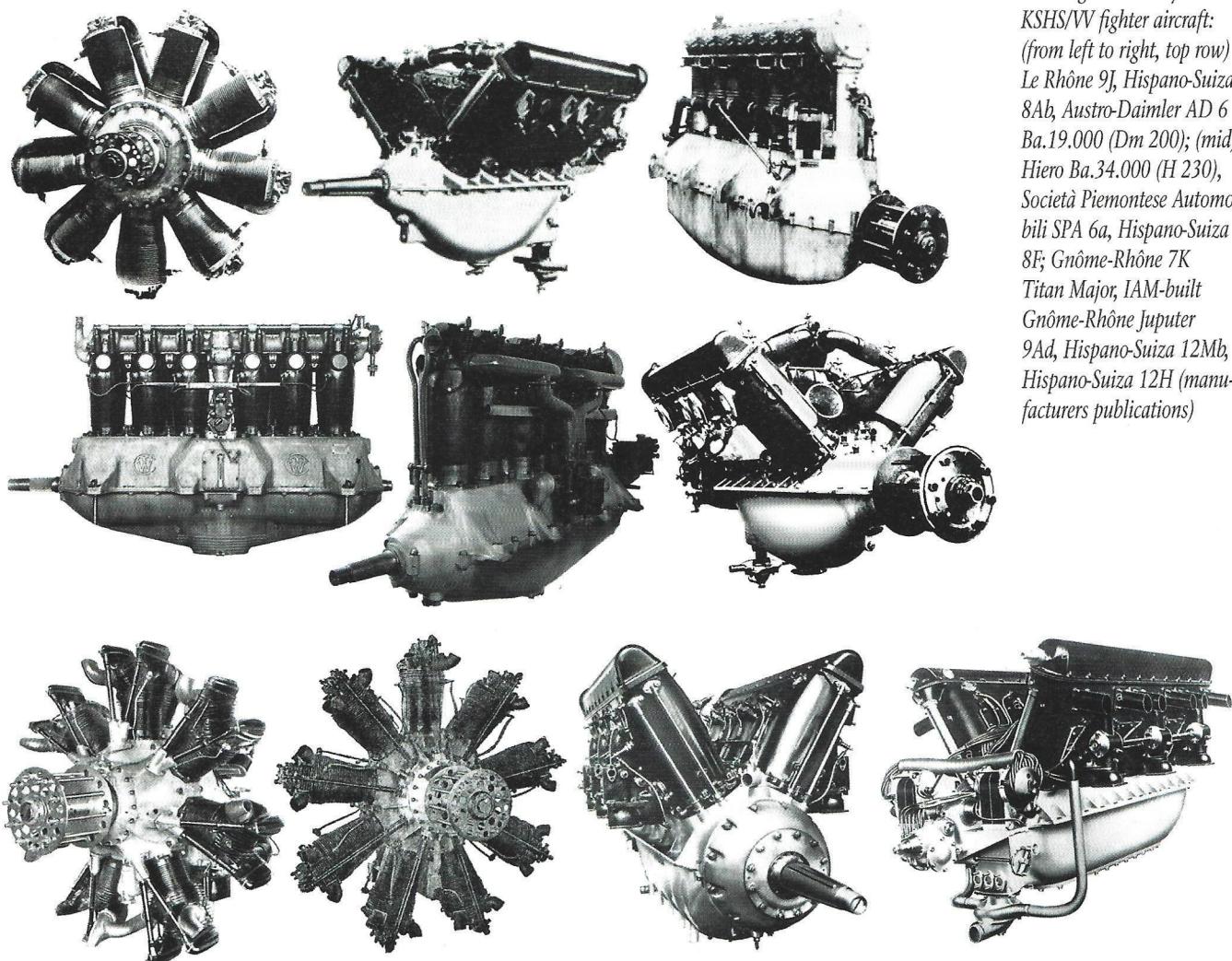
бригада (Brigade)	Comprised of two to three bomber or fighter regiments
пук (Regiment)	Composed of two to three fighter or two bomber Aviation Groups
группа (Group)	A tactical unit consisting of two to three <i>escadrilles</i>
ескадрила (Escadrille)	A unit consisting of six, nine or 12 aircraft

## Appendix 7. Abbreviations

auslandisch	a	Foreign
Акционарско Друштво	AD	Joint Stock Company
аеропланска ескадра, ескадрила	AE	Aeroplane Escadre, Escadrille
Армијска област	AO	Army District
Аеропланска радионица	AR	Aeroplane Workshop
Армијско ваздухопловство	AV	Army Co-operation Aviation
Bauart	Ba.	series
брой	Br	number
бомбардерски пук	BP	Bomber Regiment
Constructions Aéronautiques Dewoitine	CAD	Aeronautical Constructions Dewoitine
Constructions Aéronautiques Émile Dewoitine	CAED	Aeronautical Constructions Émile Dewoitine
cheval vapeur (French power unit)	CH	Equal to 7 kg/s, i.e. 735.3 watts
	c/n	Construction number
Centre de Réception des Avions de Serie	CRAS	Centre for Series Aircraft Reception
ескадрила	E	<i>Escadrille</i>
Ελληνική Βασιλική Αεροπορία	EVA	Royal Hellenic Air Force
Eidgenössische Konstruktions Werkstättes	EKW	Swiss Federal Construction Workshop
Фабрика авиона Краљево	FAK	Aircraft Factory Kraljevo
Forțele Aeriene Regale ale României	FARR	Royal Romanian Air Force
Fliegerarsenal	Flars	Aviation Arsenal
Fliegerkompagnie	Flik	Flying company
	HQ	Headquarters
horse power (imperial power unit)	hp	Equal to 33,000 lbs ft/min i.e. 745.7 watts

<i>Индустрија аеропланских мотора</i>	IAM	Aero Engines Industry
<i>извиђачка група</i>	IG	Reconnaissance Group
<i>Извиђач Обални</i>	IO	Coastal Reconnaissance
<i>коњска снага (Serbian power unit)</i>	KS	Equal to 7 kg/s, i.e. 735.3 watts
<i>Краљевина Југославија</i>	KJ	Kingdom of Yugoslavia
<i>Краљевина Срба, Хрвата и Словенаца</i>	KSHS	Kingdom of Serbs, Croats and Slovenes
<i>Kaiserliche und Königliche Luftfahrtruppen</i>	k.u.k LFT	Imperial and Royal Aviation Troops
<i>Команда Ваздухопловства</i>	KV	Air Force Command
<i>ловач</i>	L	Fighter
<i>ловачка бригада</i>	LB	Fighter Brigade
<i>ловачка ескадрила</i>	LE	Fighter <i>Escadrille</i>
<i>Ловачка пилотска школа</i>	LPŠ	Fighter Pilot School
<i>Établissements Lioré-et-Olivier</i>	LeO	Établissements Lioré-et-Olivier
<i>ловачки пук</i>	LP	Fighter Regiment
<i>Ловач ваздухопловно-технички</i>	LVT	Fighter Aviation-Technical
<i>Мали Бранденбург</i>	MB	Small Brandenburg
<i>k.u.k. Marineluftwaffe</i>	MLW	Imperial and Royal Naval Air Service
<i>Ministerstvo národní odbrany</i>	MNO	People Defence Ministry
<i>Министарство Војске и Морнарице</i>	MViM	Ministry of War and Marine
<i>metric horse power (power unit)</i>	mhp	Equal to 7 kg/s, i.e. 735.3 W
<i>нумера, број</i>	№	numéro, number
<i>Nezavisna država Hrvatska</i>	NDH	Independent State of Croatia
<i>Österreichische Flugzeugfabrik A.G.</i>	Öffag	Austrian Aircraft Factory
<i>Пилотска школа</i>	PS	Pilot School
<i>Поморско ваздухопловство</i>	PV	Naval Air Service
-	RAF	Royal Air Force
<i>резерва, резервни</i>	rez	reserve
-	R.F.C.	Royal Flying Corps
-	RYAF	Royal Yugoslav Air Force (i.e. VV)
<i>Société Aéronautique Francaise-Avions Dewoitine</i>	SAF-AD	French Aeronautical Company – Dewoitine Aircraft
<i>Средњи Бранденбург</i>	SB	Mid Brandenburg
<i>Société d'Emboutissage et de Constructions Mécaniques</i>	SECM	Stamping and Mechanical Constructions Company
<i>серијски број</i>	s/n	serial number
<i>Societa Piemontese Automobili</i>	SPA	Piamontese Automobile Company
<i>Section Technique de l'Aéronautique</i>	STAé	Technical Section of Aéronautics
<i>Savoia-Verduzio-Ansaldo</i>	SVA	Savoia-Verduzio-Ansaldo
<i>Српска авијатика</i>	SA	Aeronautic of the Serbian Army or <i>Aéronautique de l'Armée Serbe</i>
<i>Српска ескадрила</i>	SE	Serbian <i>Escadrille</i>
<i>Société provisorielle des Aéroplanes Deperdussin</i>	SPAD	Provisional society of Deperdussin aircraft
<i>Школски Бранденбург</i>	ŠB	Training Brandenburg
<i>Štab Vazduhoplovstva vojske</i>	ŠVV	Army Air Force HQ (RYAF HQ)
<i>Технички парк</i>	TP	Technical Park
-	UK	United Kingdom
<i>Versuch</i>	V	Trial
<i>Ваздухопловство</i>	V	Aeronautique, Air Force

ваздухопловна база	VB	Airbase
ваздухопловна група	VG	Aviation Group
ваздухопловна извиђачка група	VIG	Air Reconnaissance Group
Ваздухопловна команда	VK	Air Force Command
Ваздухопловство Краљевине СХС	V KSHS	Aeronautics of the Kingdom of SHS
Vojensko Letectvo	VL	Military Aviation
Ваздухопловна опитна група	VOG	Air Test Group
ваздухопловни пук	VP	Aviation Regiment
Ваздухопловно-технички парк	VTP	Aviation Technical Park
Ваздухопловно-технички завод	VTZ	Aviation Technical Depot
Ваздухопловство војске	VV	Army Aeronautic, Army Air Force (i.e. RYAF – Royal Yugoslav Air Force)
Ваздухопловна школа гађања	VŠG	Air Gunnery School
војно евиденцијски број	EvBr	Army (or Military) Evidence Number – RYAF serial number
Werke Nummer	W.Nr.	construction number
Zrakoplovstvo Nezavisne države Hrvatske	ZNDH	Independent State of Croatia Air Force



*Aero engines used by V KSHS/VV fighter aircraft:  
(from left to right, top row)  
Le Rhône 9J, Hispano-Suiza 8Ab, Austro-Daimler AD 6  
Ba.19.000 (Dm 200); (mid)  
Hiero Ba.34.000 (H 230),  
Società Piemontese Automobili SPA 6a, Hispano-Suiza 8F; Gnome-Rhône 7K  
Titan Major, IAM-built  
Gnome-Rhône Jupiter  
9Ad, Hispano-Suiza 12Mb,  
Hispano-Suiza 12H (manufacturers publications)*

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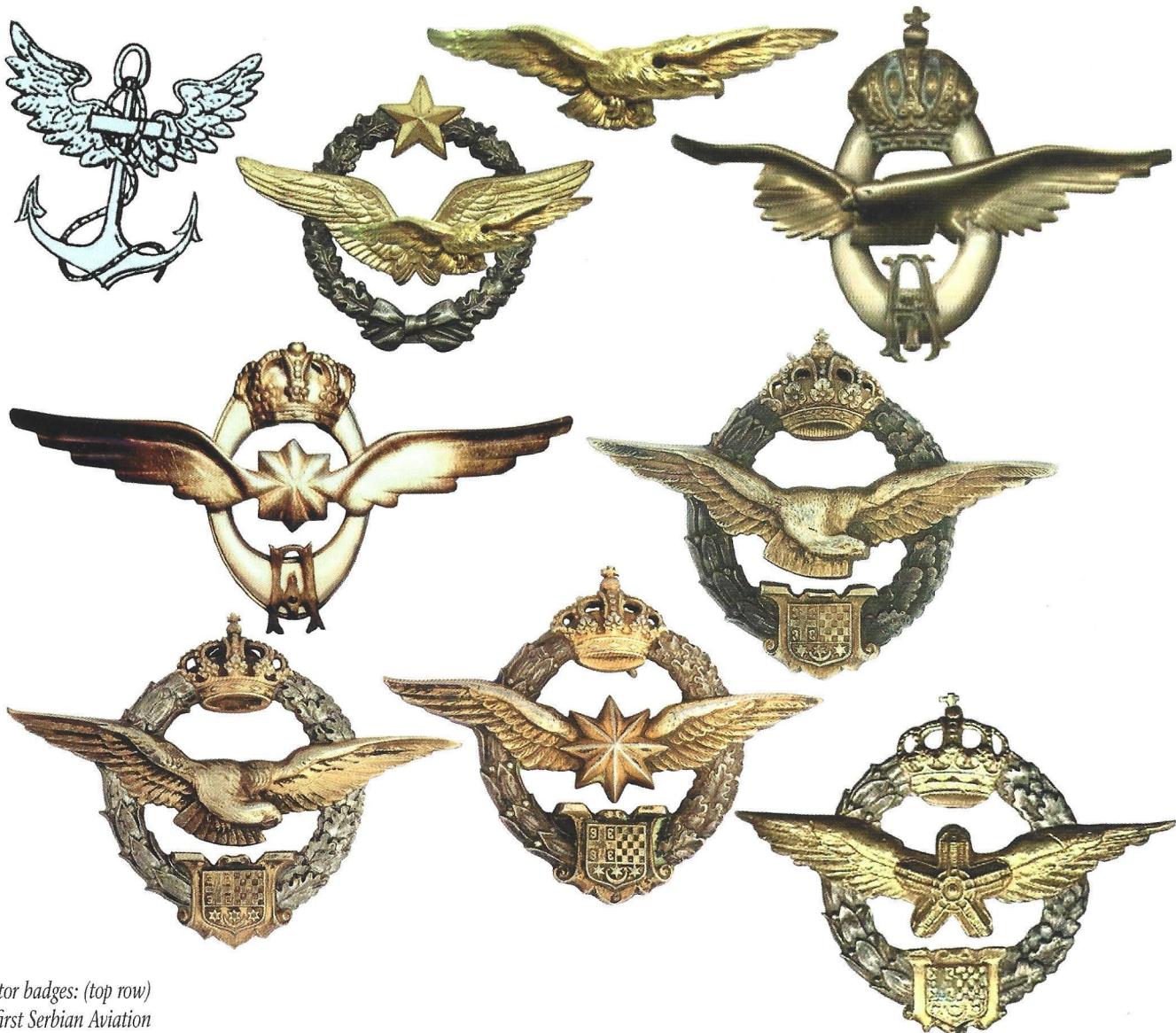
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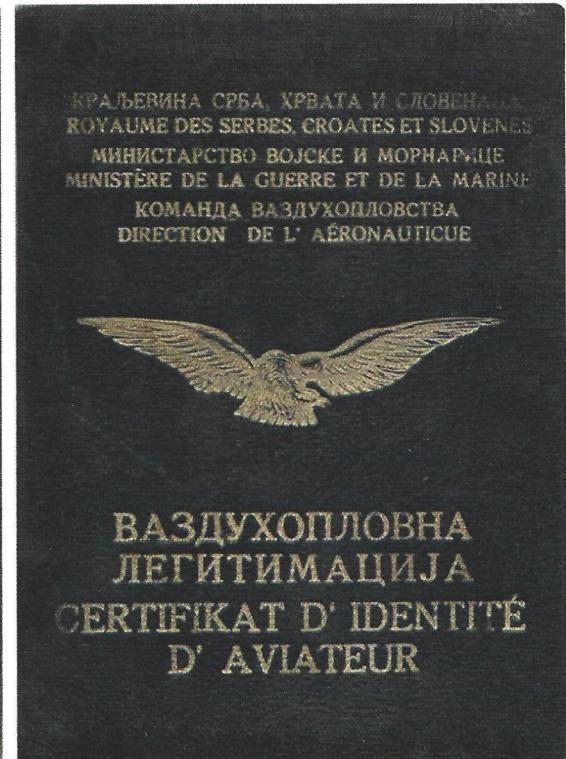
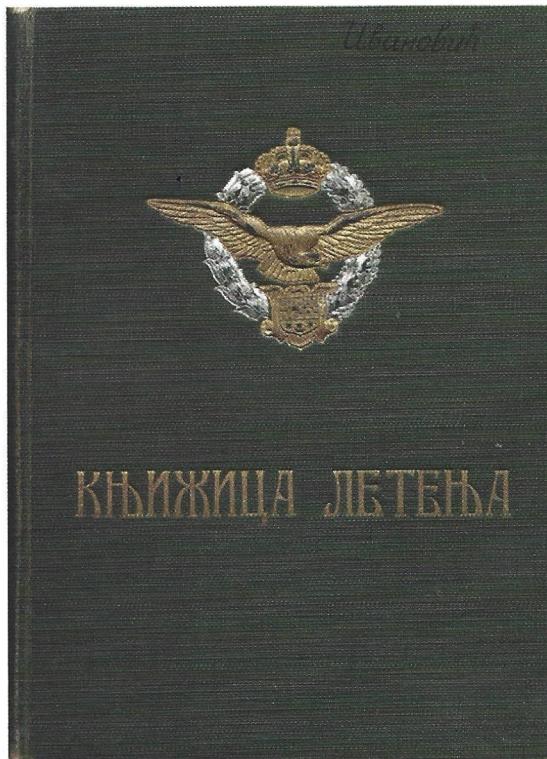
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 Österreichische Nationalbibliothek, Vienna, Austria  
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 Technical Museum Brno, Brno, Czech Republic  
 Laboratoire Eiffel, Paris, France  
 ETH Zürich, Zürich, Switzerland



Aviator badges: (top row) the first Serbian Aviation badge from 1912; French graduated pilot badge used by Serbian pilots on Macedonian front 1916–1918; French Pilot Wings "Bijou Fix" 1916; V KSHS fighter-pilot badge M1922; (mid row) V KSHS aviation navigator badge 1922; V KSHS/VV pilot badge KK (Karnet Kysely) M1927/1936 I type; (bottom row) VV pilot badge GK (Griesbach i Knaus) M1936 II type; V aviation navigator KK M1936 II type; VV aero-mechanic badge M1936.

VV Pilot logbook and aviator identification certificate (both Djordje Nikolic).



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